IBEDFORD PUBLIC SCHOOLS
MASSACHUSETTS

INVITATION FOR BID

LT. JOB LANE ELEMENTARY SCHOOL ADDITION AND RENOVATION PROJECT MANUAL

Bedford Facilities Department
101 McMahon Road
Bedford, MA 01730

May 11, 2016

Prepared by:
Taissir Alani, Director of Facilities
TBA Architects, Inc.

Awarding Authority:
Bedford Public Schools School Committee

Advertised Bedford Minuteman: May 12, 2016
Central Register: May 11, 2016
Local Posting: May 11, 2016

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PROJECT MANUAL

PART A

INSTRUCTIONS TO BIDDERS AND GENERAL CONDITIONS

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INVITATION TO BID

The Town of Bedford, Massachusetts School Committee, hereinafter called the "Awarding Authority", will receive sealed bids from DCAM qualified contractors, addressed to the Bedford Facilities Department, 101 McMahon Road Bedford, MA 01730. General Bids will be received until 2:00 p.m. prevailing time, June 8, 2016 and then publicly opened and read for:

LT. JOB LANE ELEMENTARY SCHOOL ADDITION AND RENOVATION PROJECT

The plans and specifications, hereinafter called the "Project Manual" as prepared by the Awarding Authority and TBA Architects, Inc., describe the project for the Lt. Job Lane Elementary School Addition and Renovation Project at 66 Sweetwater Avenue, Bedford, MA 01730. Bidding procedures shall be in accordance with Massachusetts General Laws, Chapter 149. The Scope of Work includes renovation of and addition to an existing 2-story school building. Work includes selective demolition; general construction and related site work; plumbing, heating and ventilation, electrical systems; new fire suppression sprinkler and air conditioning systems. The estimated cost of the Work is $2,750,000.00

Each General Contractor shall submit with their bid, both a current Certificate of Eligibility, in the category of General Construction, as issued by the Division of Capital Asset Management and Maintenance, Commonwealth of Massachusetts, showing approval for the size and nature of the project herein advertised, Update Statement current as of the date of the bid, in order to be considered for this project. The apparent low bidder must also furnish to the Awarding Authority a copy of the Contractor Qualification Statement referenced by the Update Statement furnished with the bid documents.

SUB-TRADE INFORMATION:

Filed Sub-Bids for the trades listed below will be received until 2:00pm prevailing time, Tuesday, May 31, 2016 and the results will be issued to the General Contractors as an addendum no later than 48 hours prior to the General Bid opening.

SUB-TRADES:

Roofing and Flashing, Metal Windows, Acoustical Tile, Tile, Resilient Floors, Glass and Glazing, Painting, Plumbing, Heating, Ventilating and Air-Conditioning, Electrical, Masonry, Fire Protection

MINORITY BUSINESS ENTERPRISE (MBE) AND WOMEN BUSINESS ENTERPRISE (WBE) GOALS:

The Lt. Job Lane Elementary School Addition and Renovation Project is subject to the current Affirmative Marketing Goals developed by the Division of Capital Asset Management and Maintenance (DCAMM) in consultation with the Supplier Diversity Office (SDO) as a combined MBE/WBE Goal of 10.4%. The combined goal requires a reasonable representation of both MBE and WBE firm participation on the project as further set forth in Attachment A.

The Project Manual will be available **on or after May 18, 2016**, between the hours of 9:00 AM and 3:00PM, Monday through Friday. Email marcia_pyles@bedford.k12.ma.us to request the project manual.

All bids must be accompanied by a bid security in the form of a certified, treasurer's or cashier's check, drawn upon a responsible bank, or a bid bond, each in the amount of five percent (5%) of the total bid price, payable to the Town of Bedford.

A Performance Bond, as well as a Labor and Materials or Payment Bond, each in such a form as prescribed in the Instructions to Bidders and acceptable to the Awarding Authority, will be made part of the Contract with the General Contractor who shall be awarded this Bid. All bonds must be drawn for One Hundred Percent (100%) of the Total Contract Price.

A pre-bid meeting will be at 3:00 p.m. on May 25, 2016 at the Lt. Job Lane Elementary School, 66 Mudge Way, MA 01730.

Bids are subject to M.G.L. c149 §44A-J, as amended, and to minimum wage rates as required by M.G.L. c149 §26 to 27D inclusive.

The Awarding Authority reserves the right to waive irregularities and to reject any or all bids if it is in the public's interest to do so, and to reject any bid if the Awarding Authority determines that such bid does not represent the bid of a person competent to perform the work as specified or if fewer than three bids are received for this work.

TOWN OF BEDFORD
Taissir Alani
Facilities Department
Bedford, Massachusetts

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INSTRUCTIONS TO BID

GENERAL INFORMATION:

Project:	Addition and Renovation Project Lt. Job Lane Elementary School 66 Sweetwater Avenue Bedford, MA
Estimated Construction Cost:	$2,750,000.00
Owner:	Town of Bedford Bedford, Massachusetts
Awarding Authority:	Bedford Public Schools School Committee 101 McMahon Road Bedford, Massachusetts 01730
Owner Representative:	Town of Bedford Taissir Alani, Director of Facilities 101 McMahon Road Bedford, Massachusetts 01730
Designer:	TBA Architects, Inc. 43 Bradford Street, Suite 300 Concord, MA 01742

Project Timeline:	Pre-Bid Meeting:	May 25, 2016 at 3:00 p.m.
	Sub-bids Due Date:	June 1, 2016 at 2:00 p.m.
	General Bid Due Date:	June 8, 2016 at 2:00 p.m.
	Contract Award:	June 14, 2016
	Notice to Proceed Date:	June 20, 2016
	Substantial Completion Date	August 1, 2017
	Final Completion Date:	September 3, 2017

Bonds:	100% Payment and 100% Performance Bonds
Bid Security:	5% bid security in the form of certified check or a bid bond

1. DEFINITIONS:

The Project Manual consist of the Invitation for Bid Advertisement, Instructions to Bidders, completed Bid Proposal Forms, completed Contract Forms, General Conditions, Supplemental Conditions, Specifications, Drawings, All Attachments, and all addenda issued during the bidding period, other documents listed in the agreement and modifications issued after execution of the Contract. These documents form the Contract.

1.1 Drawings and Specifications are those drawings and specifications prepared for this project by the TBA Architects, Inc. dated May 18, 2016.

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INSTRUCTIONS TO BID

1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Contract Documents are applicable to Bidding Documents.

1.3 The Awarding Authority and the Contractor are those mentioned as such in the Contract Documents. They are treated throughout the Contract Documents as if each were of the singular number and masculine gender.

1.4 The term Subcontractor, as employed herein, includes only those having a direct contract with the Contractor and it includes one who furnishes material worked to a special design according to the Drawings or Specifications of this Work, but does not include one who merely furnishes material not so worked.

1.5 "Written notice" shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by certified mail or by a form of overnight delivery, to the last business address known to him who gives the notice.

1.6 "Work" of the Contractor or Subcontractor (whether in whole or in part) includes labor and/or materials, equipment, and services provided or to be provided by them to complete the Project work or services described in the contract documents, including separate Contractors or the Owner.

1.7 The "Date of Substantial Completion" (Contract Time) of a project or specified area of a project is the date when construction is sufficiently completed, in accordance with the Contract Documents, as modified by any Change Orders agreed to by the parties, so that the Awarding Authority can legally occupy the project or specified area of the project for the use it was intended and all work completed to the satisfaction of all state and local agencies having jurisdiction.

1.8 "Final Completion" is the date of acceptance of the Project by the Awarding Authority. This represents that all Work, all required close-out documents, Drawings, warranties, etc. have been accepted and are in the Owner's possession. This date shall not exceed the Substantial Completion date by more than thirty (30) calendar days unless modified by Change Order.

1.9 “Addenda” are written or graphic instructions created by the designer and distributed by the Owner prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

1.10 A “Bid” is a complete and properly signed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.11 The “Base Bid” is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

1.12 The "Awarding Authority" means the Bedford Public Schools, acting by and through its duly elected School Committee.

1.13 The "Owner" means the Town of Bedford, Awarding Authority, the Owner or the Owner's authorized representative.

1.14 The “Owner's Representative” means the Town of Bedford, Director of Facilities

1.15 The “Designer” means the architect, engineer or consultant that prepared the Part B Technical Specifications of the project manual.

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INSTRUCTIONS TO BID

1.16 The "Contractor" unless especially noted or evident to the contrary, the "Contractor" as used in these specifications signifies the Bidder awarded the Lt. Job Lane Elementary School Addition and Renovation Project.

1.17 The "General Contractor" is TBD.

1.18 A "Bidder" is a person or entity submitting a Bid.

2. SECURING DOCUMENTS.

Copies of the proposed Contract Documents may be obtained for bidding purposes upon the conditions set forth in the Invitation for Bids.

3. GENERAL BIDDER QUALIFICATIONS.

GENERAL BIDDERS QUALIFICATIONS:

1. The contractor shall be certified by the Division of Capital Asset Management and Maintenance (DCAMM) of the Executive Office for Administration and Finance, Commonwealth of Massachusetts in the category of General Construction for projects of the size advertised. Each bidder shall submit with his or her bid a DCAMM certificate of eligibility with a current update statement in the categories specified herein.
2. The Contractor shall have a minimum of five (5) years' experience in General Construction of School building projects.
3. The contractor shall have completed the installation of three (3) similar Addition and Renovation projects within the past five years. A similar project is one that required the construction, installation and rehabilitation of Mechanical, Electrical and Plumbing building systems.
4. OSHA ten hour training for all employees assigned to work on this project.
5. Contractor compliance with the Minority Business Enterprise (MBE) and Women Business Enterprise (WBE) participation.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE OF WORK.

The Bidder shall examine carefully in detail, the site of the project, and the Contract Documents as defined in the General Conditions, and all other matters pertinent to the proposed work. It will be assumed that he/she has satisfied himself/herself as to the conditions to be encountered overhead, on the surface and underground, the character, quality and quantities of work to be done and materials to be furnished, and the requirements of the Project Manual. No allowance or concession will be made for lack of due diligence on the part of the Contractor. Bidders should take particular note of information provided in Section titled "Summary".

5. ADDENDA AND INTERPRETATIONS. All questions by prospective bidders as to the interpretation of the Instruction to Bidders, form of contract, plans, specifications, or any other matter pertaining to this solicitation must be submitted in writing to the Director of Facilities, Town of Bedford, and must be in his possession no later than 12:00 Noon on **May 27, 2016 for Sub-bidders and June 3, 2016 for General Bidders**. Any interpretation of the Contract Documents will be made only by an addendum issued by the Town of Bedford. All addenda will be sent by the most efficient means including but not limited to mail, email and or fax by the Awarding Authority to all bidders, who have taken out the Project Manual, to the address given by the Awarding Authority before the date set for the opening of bids. Oral interpretations given to prospective bidders are not binding.

5.1 Addenda Acknowledgment: Each bidder is required to acknowledge receipt of all addenda in the spaces provided in the Bid Form. It shall be the sole responsibility of bidders to ascertain the existence of any and all addenda issued by the Awarding Authority whether or not the addenda are presented or mailed to, emailed to, faxed to or received by the bidders. Failure to acknowledge receipt of all addenda may cause the bid to be rejected.

6. SURETY. Should the Surety on any Bond furnished in connection with this Contract become unacceptable or be

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INSTRUCTIONS TO BID

deemed unsatisfactory to the Awarding Authority at any time, the Contractor shall upon written notice from the Awarding Authority, promptly furnish acceptable or substitute Surety as may be required to protect the interests of the Awarding Authority or of persons supplying services (including rental of equipment), labor, or materials in the prosecution of the work under Contract. No further payment shall be deemed due or shall be made under this Contract until the new Surety or Sureties shall qualify and be accepted by the Awarding Authority.

6.1 Surety Bonds: Prior to award of the Contract the apparently successful low Bidder will be required to furnish within the time specified under these Instructions a "PERFORMANCE Bond" covering faithful and satisfactory performance of the work contracted, in an amount not less than one hundred (100) percent of the Contract amount; and a PAYMENT Bond in an amount not less than one hundred (100) percent of the Contract amount, covering payment in full for all services (including reasonable rentals of equipment for certain periods) rendered, materials furnished and labor supplied or performed. The same Surety must execute both Bonds. All Bonds shall be issued by companies authorized to transact business in the Commonwealth of Massachusetts. All Bonds shall be in the form of those of the American Institute of Architects, except that the Payment Bond shall comply with M.G.L. Chapter 149 Section 29.

7. BID BOND: Each Bid must be accompanied by security in the form of a certified check, or a bid bond payable to the Town of Bedford, in the amount indicated in the Invitation to Bid. Such Bid security of the successful bidder shall be used for the payment of liquidated damages to the Owner in the manner described in the form of the "Bid Bond" should the successful bidder fail to furnish the Payment Bond, Performance Bond and the insurance certificates and copies of policies as specified in the Contract Documents, within five (5) days after notification by the Awarding Authority to furnish such bonds; or fails to execute and deliver the Contract in the form specified in the Contract Documents within five (5) days after notification by the Awarding Authority to execute and deliver said Contract.

Within five (5) days after the formal opening of bids Saturdays, Sundays and legal holidays excluded, the securities therefore will be returned except those of the three lowest responsible and eligible general bidders, which the Awarding Authority will hold until the award is made and the successful Bidder qualifies and executes the Contract. Thereafter, Bid Securities, other than that of the qualified low Bidder, will be returned at once. The security of the successful Bidder will be returned to him when the Contract is executed by both parties hereto and the Contractor has furnished the bonds and insurance certificates as required by the Contract Documents. If all Bids are rejected, the securities therefore will be returned immediately after the determination of such rejection.

8. PREPARATION OF BID. The Contractor shall prepare his Bid by completely filling in the forms contained in these Instructions to Bidders, which will be provided by the Awarding Authority as part of its Contract Document package. The various forms contained in the Bid must be properly executed in ink without alterations.

Using the prescribed forms bound within the Bid, all bid prices shall be written in ink in the blank spaces provided for each item, with the amount extended if a unit price bid, and a total of all amounts extended. For unit price items, the "unit price" shall govern in the event of occurrence of a multiplication error in arriving at a total price for the item bid.

In unit price bids, the extensions, if any, and the total are for informational purposes only, and the determination of the lower bid will be based solely on the total results of computations of the estimated quantities and the unit prices bid including any combination of alternates authorized by the Bid.

The Bidder shall sign his name and give his business address in the space provided therefor. If the Bid is made by a partnership, it shall be signed by a general partner; if made by a corporation it shall be signed in the name of the corporation by the President or Vice President, or by a duly authorized agent due proof of whose authority shall be attached; and shall have affixed the seal of the corporation attested by the Secretary or an Assistant Secretary.

8.1 Unit Pricing:

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INSTRUCTIONS TO BID

Approximate Estimate of Quantities: The Bidder's attention is directed to the fact that in contracts based on unit prices, the estimate of quantities of work to be done and materials to be furnished under these Specifications, as indicated in the Bid, is approximate and is given only for the benefit of the Awarding Authority, to be used as a basis of calculation upon which to determine the lowest bidder. Neither the Awarding Authority nor Engineer assumes any responsibility that the quantities indicated shall be obtained in the construction of the Project, nor shall the Contractor plead misunderstanding or deception because of such estimate of quantities, or the character of the work or location, or other conditions pertaining thereto. The Awarding Authority reserves the right to increase or diminish any or all of the above mentioned quantities of work or to omit any of them as it may deem necessary; and any such increase or decrease of the quantities given for any of the items shall not be considered as sufficient ground for granting an increase in the unit prices bid, except as set forth in the General Conditions Section E. Exceptions and Modifications item 01 Changes in Work.

Unit Price:

8.1.1 Not Applicable

8.2 Bid Alternates: Using the prescribed forms bound within the bid fill in the "add" line if the Owner's acceptance of the alternate will increase the proposed Contract price, subject to the availability of funding, fill in the "Subtract" line if the Owner's acceptance of the alternate will decrease the proposed Contract Price. If an alternate does not affect the proposed Contract Price, enter $0 or "No Charge."

8.2.1 Renovation of Student Office, Nurse Suite and Teachers Lounge

8.2.2 Parking Lot/Loop expansion and Playground relocation

8.3 Submitting Bid: Bids, accompanied by Bid Security, shall be submitted in an opaque envelope, **SEALED** and addressed to the Town of Bedford. The Bidder's name shall appear in the upper left-hand corner of the envelope; and the descriptive title of the Project shall be entered in the lower left hand corner of the envelope under the words "Bid Documents".

9. RECEIPT OF BIDS. The place at which Bids must be delivered, the amount of Bid Security required, and the date, time and place of opening of Bids, are stated in the Invitation to Bid.

10. WITHDRAWAL OF BIDS. All Bidders specifically waive any right to withdraw a Bid after it has been submitted to the Awarding Authority, except as provided in the following:

10.1 Prior to Date and Time for Opening Bids. A bidder may withdraw a Bid, prior to the date and time for the opening of Bids, if a written request to withdraw the Bid is delivered to the Awarding Authority by an accredited representative of the Bidder or by U.S. mail, and actually received by the Awarding Authority prior to the time set for the opening of Bids.

10.2 On and After Date and Time for Opening Bids. No Bid may be withdrawn at the date and time for the opening Bids nor for a period of thirty (30) days after the opening of General Bids, Saturdays, Sundays and Legal Holidays excluded.

11. BID REJECTION. The unqualified right is reserved by the Awarding Authority, at its sole option, to waive any informalities, irregularities, defects, errors or omissions in any or all Bids and to reject any or all Bids as may be deemed to be in the best interest of the Awarding Authority. Bids which contain omissions, erasures, alterations, additions not called for, conditional bids or irregularities of any kind, or Bids otherwise regular which are not accompanied by Bid Security, may be rejected as informal. Bids which fail to comply with any instructions to bidders or which are unbalanced may be rejected. The Awarding Authority reserves the right to reject any sub-bid on any sub-trade, if it is determined that such sub-bid does not represent the sub-bid of a person competent to perform the work as specified or that less than three such sub-bids where received and that the prices are not reasonable for

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acceptance without further competition.

12. COMMONWEALTH OF MASSACHUSETTS REQUIREMENTS.

12.1 Attention is directed to Chapter 149 of the General Laws and Amendments thereto regulating competitive bidding in the award of contracts for public building projects, and the selection of sub-bidders, and applicable sections of which by reference become a part of the information for bidders, and to all other statutory or other pertinent law, applicable thereto.

12.2 STATE FUNDED BUILDING PROJECTS

Pursuant to M.G.L. c 7, §40N and M.G.L. c. 7, §61, the Supplier Diversity Office ("SDO") (formerly SOMWBA) and the Division of Capital Asset Management ("DCAM") have set revised participation goals for Minority Business Enterprise ("MBE") and Women Business Enterprise ("WBE") participation for affected state funded building projects and state assisted municipal building projects as defined in the above referenced laws and related Executive Orders, including Executive Orders 524 and 526.

Effective January 1, 2012, and until such time as the goals may be revised, the MBE and WBE participation goals for building construction and design awards and expenditures on new projects advertised on or after the effective date will be a combined MBE/WBE goal as follows:

10.4% combined MBE/WBE participation on construction contract awards; and,

Overall annual designations by awarding authorities, as well as MBE/WBE participation on individual projects with a combined MBE/WBE participation goal, must include a reasonable representation of both MBE and WBE firms that meets or exceeds the combined goal. Proposed MBE/WBE participation plans that include solely MBE or solely WBE participation, or do not include a reasonable amount of participation by both MBE and WBE firms to meet the combined goal, will not be considered responsive. Where the prime contractor or designer is an SDO certified MBE or WBE, the prime must bring a reasonable amount of participation by a firm or firms that hold the certification which is not held by the prime contractor or designer on the project. Proposed participation on construction projects or design projects which consists solely of either an MBE or WBE representing 100% of the overall combined goal will not be considered reasonable participation.

The SDO and DCAM will determine whether there is reasonable participation by both MBE and WBE firms on individual projects under their respective oversight. Firms submitting MBE/WBE participation plans which do not provide reasonable participation by both MBE/WBE firms shall be provided an opportunity to revise and resubmit their plans within the time frame set by the awarding authority; however no price adjustments shall be permitted as a result of the revised plan. Firms failing to submit an MBE/WBE participation plan deemed reasonable and accepted by the awarding authority shall not be awarded the contract.

Participation by MBE and WBE firms must be documented, tracked and reported on separately as MBE participation and WBE participation by prime vendors, subcontractors and awarding authorities..

3. FILING PROCEDURE

13.1 Bid documents submitted by all bidders to the Owner shall be submitted in single copy and enclosed in a single envelope and delivered to the address given in the Invitation for Bids. The envelope containing bid documents shall be sealed and clearly labeled with the words "Bid Documents", the project name, bidder's name, bidder's business address, and bidder's phone numbers.

13.2 Attach to the Bid Form all required submittals as required herein.

13.3 If forwarded by mail, the sealed envelope containing the Bid and other required documents marked as

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INSTRUCTIONS TO BID

directed above must be enclosed in another envelope addressed in the same manner. The Owner hereby disclaims any responsibility for receipt of mailed bids in time for the bid opening.

13.4 Bids received prior to the time established herein for the opening of bids will be securely kept, unopened. The Owners Representative whose duty it is to receive and to open all bids will, when the specified time, per the time on the wall clock in the Town Manager's Office has arrived for the opening of bids, publicly open and read them. No responsibility will be attached to the Owners Representative for premature opening of a bid not properly addressed and identified.

14. INSURANCE REQUIREMENTS: The Owner requires that the successful bidder submit a certificate of insurance in the amounts specified in the General Conditions Section 1.17. The contract will not be effective and the Town will not authorize or pay for any services performed prior to contract signing. No contract will be signed until the correct certificate of insurance and required bonds are received and accepted by the Owner.

The Owner further requires that all certificates name the Town of Bedford as an "Additional Insured." With the exception of Worker's Compensation and Automobile Liability, the Owner will not accept being named as "Certificate Holder" only. Please be aware that there may be a charge for this type of policy, so check with your insurance agent prior to bid submission.

Proof of Worker's Compensation Insurance coverage must be provided prior to signing a contract with the successful bidder.

The Contractor shall not commence work under this contract until he has obtained all the insurance required in the General Conditions Section 1.17 Contract Documents and such insurance has been approved by the Owner; nor shall the Contractor allow any subcontractor to commence work on his subcontract until the insurance required of the subcontract has been so obtained and approved.

15. FOREIGN CORPORATIONS. The Owner shall not enter into a contract with a general bidder that is a foreign corporation until such foreign corporation has filed with the Owner, a certificate of the State Secretary for the Commonwealth, stating that such corporation has complied with M.G.L., C. 181, §3 and§5 and the date of such compliance. See also M.G.L., C. 30, § 39L.

16. POWER OF ATTORNEY. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power or attorney.

17. AWARD OF CONTRACT.

17.1 The acceptance of General Bids shall be in accordance with M.G.L. Chapter 149 will be awarded to the lowest responsible and eligible bidder possessing the skill, ability and integrity necessary for the faithful performance of the work, who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work, and meets all other qualifications called for in the specifications. Essential information for the determination of such responsibility and eligibility shall be submitted in such form as the Owner may require, and shall include as a minimum those documents required by Article 3, Article 5.1, Article 17, Article 19 and Article 20 of these Instructions to Bid.

17.2 The Owner shall have the right to determine the low bidder on the basis of the sum of the base bid and the alternates accepted.

17.3 The award of the contract shall be made within 30 days after opening of General Bids, Saturdays, Sundays, and holidays excluded.

17.4 The Owner shall have the right to waive informalities and irregularities in a Bid received and to reject any or all bids if it is in the public interest to do so.

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INSTRUCTIONS TO BID

17.5 The apparent low Bidder's compliance with the requirements of Attachment A through Attachment G to the Instructions for Bid is a pre-requisite for receiving the award of the Contract.

17.6 If the General Bidder selected as the General Contractor fails to execute a Contract with Owner and to furnish a Performance Bond and also a Labor and Materials or Payment Bond in accordance with the terms of the General Bid, an award may be made to the next lowest responsible and eligible General Bidder. The thirty (30) day time limit will not apply to a second of subsequent award made after the expiration of the time limit because the General Bidder failed to execute the General Contract or to provide a Performance Bond and Labor and Materials or Payment Bond.

18 PROJECT SCHEDULE: The project schedule for the work is as follows:

Award of Construction Contract	June 14, 2016
Construction Notice to Proceed	June 20, 2016
Start Construction	June 24, 2016
Substantial Completion Date:	August 1, 2017
Final Completion Date:	September 3, 2017

19 EXECUTION OF CONTRACT. The Bidder to whom an award, if any, is made shall execute the Contract Agreement and furnish the required performance and payment bonds and certification of insurance within five (5) days after being given notice of the award, Saturdays, Sundays and legal holidays excluded. The Awarding Authority may require appropriate evidence that the person executing the Contract Agreement and the bonds for both the Bidder and his surety or sureties are duly empowered to do so. Separate performance and payment bonds are required, each in an amount at least equal to the Total Bid Price. The surety or sureties shall be a corporation or corporations acceptable to the commission. Alterations, extensions of the time for performance, extra and additional work and other changes authorized under the Contract may be made without notice or consent of the surety and sureties. The Performance Bond shall remain in effect for two years after final acceptance of the work.

20. FORMS REQUIRED TO BE SUMBITTED FOR BIDS:

20.1 FORMS TO BE SUBMITTED PRIOR TO BIDS, if applicable

- Request for Pre-bid Reduction/Waiver of MBE/WBE participation Goals, MUST BE SUBMITTED 10 DAYS PRIOR TO BID DUE DATE, Per Instructions in Attachment A of the Bid forms – IB21, 24.

20.2 FORMS REQUIRED TO BE SUBMITTED WITH GENERAL BIDS pages: IB 14 through IB 18

- Certificate of Authority (for corporation only), given on page IB 19
- DCAMM Certificate of Eligibility
- DCAMM update Statement

20.3 FORMS REQUIRED TO BE SUBMITTED WITH SUB BIDS pages: IB 27 through IB 31

- Certificate of Authority (for corporation only), given on page IB 32
- DCAMM Certificate of Eligibility
- DCAMM update Statement

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INSTRUCTIONS TO BID

GENERAL CONTRACTOR BID FORM CHECK LIST

Forms required to be submitted with bids:

- ❑ Bid Forms IB-14
- ❑ Bid Forms IB-15
- Bid Forms IB-16
- ❑ Bid Forms IB-17
- ❑ Bid Forms IB 18
- ❑ Certificate of Authority (for corporation only), given on page IB-19.
- ❑ DCAM Certificate of Eligibility
- ❑ DCAM Update Statement
- ❑ CC Form 1 Schedule of Participation, if available at time of bid IB 92
- ❑ CC FORM 2 Letter of Intent, if available at time of bid IB 93

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FORMS FOR GENERAL BID

TO: Town of Bedford
Bedford Facilities Department
101 McMahon Road
Bedford, MA 01730

FROM: _____
(Name of Bidder)

_____
(Address)

_____

☐ Check if Bidder is a MBE/WBE

A. The undersigned proposes to furnish all labor, materials, and equipment required for the Lt. Job Lane Elementary School Addition and Renovation Project, 66 Sweetwater Avenue, Bedford Massachusetts, in accordance with the Project Manual, Specifications and Drawings prepared by the Town of Bedford and TBA Architects, Inc. dated May 11, 2016 for the Contract Price specified below, subject to additions and deductions according to the terms of the Contract Documents.

B. The bid includes addenda numbered:

Addendum No._____ Date:_____ Addendum No._____ Date:_____
Addendum No._____ Date:_____ Addendum No._____ Date:_____

C. The Proposed Contract price is (does not include Alternates):

. _____dollars($_____)

Alternates:

No. 1	Renovation of Student Office, Nurse Suite, and Teachers Lounge	Add $ _____;	Subtract $
No. 2	Parking Lot/Loop Expansion and Playground	Add $ _____;	Subtract $

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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:

Total of Item 1: _____Dollars ($_____)

Item 2: Sub-Bids as follows:

Sub-Trade	Sub-Bidder	Bonds Required (Yes or No)	Contract Sum
Roofing and Flashing (Specification Section 07.53.05)			
Metal Windows (Specification Section 08.51.13)			
Acoustical Tile (Specification Section 09.51.20)			
Tile (Specification Section 09.30.00)			
Resilient Floors (Specification Section 09.65.19)			
Glass and Glazing (Specification Section 08.80.00)			
Painting (Specification Section 09.90.00)			
Plumbing (Specification Section 22.00.00)			
Heating, Ventilating and Air-Conditioning (Specification Section 23.00.01)			
Electrical (Specification Section 26.00.00)			
Masonry (Specification Section 04.81.00)			
Fire Protection (Specification Section 21.00.00)			
TOTAL OF ITEM 2	$		
GRAND TOTAL (ITEM 1 AND ITEM 2)	$		

E. The undersigned hereby 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 the sub-bidders as requested herein and that all of the cost of all such premiums is included in the total 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

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Awarding Authority on the question of sub-bidders; and that the Awarding Authority may substitute for any sub-bid listed above, a sub-bid duly 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 amount name in the 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, to total contract price being adjusted to conform thereto.

F. TIME OF COMPLETION AND LIQUIDATED DAMAGES: The undersigned agrees to commence work promptly after receipt of a Notice to Proceed, and to complete the Work within the time stipulated in Article 2 of the Contract Form, subject to adjustment of the Contract Time in accordance with the Contract Documents. In the event the Work is not completed within the specified time, it is understood and agreed that the Contractor shall pay the Awarding Authority, not as a penalty but as liquidated damages, the amount set forth in Article 2 of the Contract Form for each calendar day beyond the date on which completion was required that the work is not so completed, up to and including the day of Substantial Completion.

G. CONTRACT, PERFORMANCE AND PAYMENT BONDS: The undersigned agrees, if selected as General Contractor, to execute a Contract in accordance with the terms of this General Bid within 5 days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority and to 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 100% of the Contract Price, the premiums for which are to be paid by the General Contractor and are included in the Contract Price.

H. BIDDING CERTIFICATIONS AND AUTHORIZED SIGNATURE: The following certifications are required when submitting a bid. Submission of a signed bid form constitutes acknowledgement by the Bidder of compliance with each certifications.

1. LABOR: The undersigned hereby certifies under pains and penalties that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Industries and that he or she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work, and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A of Chapter 149 of the Massachusetts General Laws.

2. NON-COLLUSION CERTIFICATION: The undersigned certifies under penalties of perjury that this bid is in all respects *bona fide*, fair and made without collusion or fraud with any other person. As used in this Paragraph, the word "person" shall mean any natural person, joint venture, partnership, union, committee, club, corporation, or any other business or legal entity.

3. TAXES: As required by MGL Chapter 62c, §49A, the undersigned certifies that he or she has complied with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

4. DEBARMENT: The undersigned hereby certifies, under penalties of perjury, that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Chapter 29, §29 F, or any other applicable debarment provisions of any other Chapter of the General Laws, or any rule or regulation promulgated thereunder.

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5. NONSEGREGATED FACILITIES: The undersigned hereby certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and tat he does not permit his employees to perform their services at any location, under his control where segregated facilities are maintained. The Bidder certifies further that he will not maintain or provide for employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The Bidder agrees that a breach of this certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom or otherwise. The Bidder agrees that (except where he has obtained identical certification from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractor prior to the award of subcontracts exceeding $10,000 which are not exempt from provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

Note: The penalty for making false statements in offers is prescribed in 18 U.S. C. Section 1001.

I. BID DEPOSIT: A bid deposit, in the amount of 5% of the proposed Contract Price, conditioned upon the faithful performance by the bidder of the agreements contained in this bid, is attached to this proposal. The undersigned agrees that, if he or she is designated as the successful bidder, but fails to execute a contract in accordance with the agreements contained in this bid, or fails to furnish a performance bond and also a labor and materials or payment bond, this bid security shall become the property of the Awarding Authority as liquidated damages; provided that the amount of the bid deposit which becomes the property of the Awarding Authority shall not, in any event, exceed the difference between the bid price of this bidder and the bid price of the next lowest responsible and eligible bidder; and further subject to the conditions set forth in M. G. L Ch. 149, §44B.

J. MISCELLANEOUS PROVISIONS:

1. The Bidder acknowledges that the Awarding Authority has the right to reject any or all bids, and to waive informalities in the bidding.
2. This bid shall be valid and will not be withdrawn for a period of 30 days, Saturdays, Sundays, and legal holidays excluded, after the date designated for opening the bids.

K. ATTACHMENTS

1. General Contractor's Current Certificate of Eligibility
2. General Contractor’s Update Statement
3. Bid Deposit.
4. Bid Forms IB 15 through IB 19
5. Certificate of Authority IB 20
6. CC Form 1 Schedule of Participation, if available at time of Bid opening IB 85
7. CC Form 2 Letter of Intent, if available at time of Bid opening IB 86

L POST BID SUBMITTALS: The undersigned agrees to furnish the following information prior to the time established for execution of the Contract:

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FORMS FOR GENERAL BID

1. Massachusetts Foreign Corporation Certificate, if applicable.
2. Schedule of Participation - Due, no later than five (5) working days after the opening of general bids (no later than June 18, 2016)
3. Letter of Intent Due - no later than five (5) working days after the opening of general bids (No Later than June 18, 2016)

SUBMITTED on _____, 2016

By _____
(Firm Name)

_____
(Authorized Signature)

_____
(Name and Title of Signatory, Typed or Printed)

_____
(Firm Address)

_____
(Firm Telephone #)

The Federal Social Security Identification Number of the Bidder (the number used on Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form, 941) is:

_____

If the Bidder is a Foreign Corporation, also state the following:

(b) The Power of Attorney required by General Laws, C. 181, §3 was filed on:

_____

(c) The Certificate and copy of its Charter, Articles, or Certificate of Incorporation required by General Laws, C. 181, §5 were filed on:

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FORMS FOR GENERAL BID

CERTIFICATE OF AUTHORITY

(Corporations Only)

At a duly authorized meeting of the board of Directors of the_____ held on
(Name of Corporation)

_____ it was VOTED, that_____
(Date) (Name) (Officer)

of this company, be and he/she hereby is authorized to execute contracts and bonds in the name and on behalf of said company, and affix its corporate seal hereto; and such execution of any contract or obligation in this company's name on its behalf by such_____ under seal
(Officer)
of the company, shall be valid and binding upon this company.

A True Copy,
Attest: _____

Title: _____

Place of Business: _____

_____

Date of this Contract: _____

I hereby certify that I am the clerk of _____that _____
is the duly elected _____ of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as the date of this contract.

_____
(Clerk)

Corporate Seal

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INSTRUCTION TO BID ATTACHMENTS

All Attachments will be incorporated and made part of the Contract.

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ATTACHMENT A

PROCEDURE FOR PRE-BID REDUCTION/WAIVER OF MBE/WBE PARTICIPATION GOALS

I. Pre-Bid Reduction/Waiver Procedures

A. Affirmative Marketing Participation Goals

Each Municipality (Awarding Authority) must enforce the current Affirmative Marketing Goals developed by the Division of Capital Asset Management (DCAM) in consultation with Supplier Diversity Office (SDO) as follows:

Design Participation:	**Combined MBE/WBE (17.9%)**
Construction Participation:	**Combined MBE/WBE (10.4%)**

The combined goals require a reasonable representation of both MBE and WBE firm participation on the project as further set forth in Attachment B, Section A, Paragraph 2.

B. Criteria for Reduction/Waiver of Goals

Potential Bidders may request a reduction or waiver of goals on a project-by-project basis before bids are submitted. The Awarding Authority reserves the right to accept and review written requests but does not have the authority to grant such requests made by a General Bidder to reduce or waive the MBE or WBE design and construction participation goals established for this Contract. In accordance with Section 7 of Chapter 193 of the Acts of 2004, such written request must demonstrate to the satisfaction of the Awarding Authority that there is no feasible way for a non-MBE or non-WBE General Bidder to meet the goals established for this contract and that a **"Diligent Good Faith Effort"** was made to comply. If this criteria is met the Awarding Authority must submit the General Bidders request to the Executive Director of the Supplier Diversity Office SDO) for final determination. Factors that may be considered in granting a reduction or waiver of the contract goals include any or all of the following:

- Actual availability of certified Minority- and/or Women-Owned Business Enterprises (MBE/WBEs);
- The geographic location of the project;
- The scope of work and opportunities for subcontracting the work;
- Other relevant factors including documented inability by the prospective Bidder to obtain commitments from MBE/WBE subcontractors sufficient to meet the MBE/WBE goals after having made a diligent, good faith effort to do so.

C. Supporting Documentation Required from Potential Construction Bidders

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

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

3. Documentation that the Bidder made reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in

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performing the work. Phone logs or other documentation must be submitted.

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

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

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

D. Process for Requesting Waiver/Reduction of Construction Goals

1. Requests from prospective general Bidders to reduce or waive the MBE/WBE participation goals for the Contract must be received by the Awarding Authority no later than **ten (10) working days before the general bids are due.**

2. The Awarding Authority shall not consider any request to reduce or waive the MBE/WBE Participation goals for the Contract that is received after the aforementioned deadlines. Any reduction or waiver of the MBE/WBE participation goals for the Contract will be made by written addendum mailed to all persons who have taken out plans for the project within a reasonable period prior to bid submission.

3. Procedures and Timelines for the Waiver/Reduction of Construction Goals can be found in the attached Model Bidding Instructions.

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INSTRUCTION TO BID ATTACHMENTS

ATTACHMENT B

MUNICIPAL CONTRACTS
STATE-ASSISTED BUILDING PROJECTS
MODEL BIDDING INSTRUCTIONS

APPENDIX TO BIDDING INSTRUCTIONS

GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES (MBE) AND WOMEN BUSINESS ENTERPRISES (WBE) (EXECUTIVE ORDER 390, M.G.L. c. 7, §4)

Design Participation: Combined MBE/WBE goal of (17.9%)
Construction Participation: Combined MBE/WBE goal of (10.4%)

The combined goals require a reasonable representation of both MBE and WBE firm participation on the project as further set forth in Attachment B, Section A, Paragraph 2.

A. MBE AND WBE PARTICIPATION

1. The apparent low Bidder's compliance with the requirements of this Section is a pre-requisite for receiving the Award of the Contract.

2. The successful Contractor must utilize a mix of both MBE and WBE firms whose participation, when added together, meets or exceeds the overall combined goal set for the Contract. It is important that both MBE and WBE firms have an opportunity to work on public projects with a combined MBE/WBE goal. Therefore, projects with a combined goal must include a reasonable representation of both MBE and WBE firms to meet or exceed the combined goal. Proposed MBE/WBE participation plans that include solely MBE or solely WBE participation, or have only nominal participation by one or the other to meet the combined goal, will not be considered responsive. Contractors that are themselves MBE or WBE certified will be required to bring a reasonable amount of participation by a firm(s) that holds the certification which is not held by the Contractor to the project. Although the Contract contains a combined goal, participation by MBE and WBE firms must be reported and tracked separately.

3. The MBE and WBE participation goals for this Contract are as set forth above. The Awarding Authority reserves the right to accept and review written requests but does not have the authority to grant such requests made by a General Bidder within the time frame set forth in paragraph 9 below to reduce or waive the MBE or WBE participation goals established for this contract. If such written requests demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non-MBE or non-WBE General Bidder to meet the goals established for this contract based upon all of the following: (i) actual MBE/WBE availability, (ii) the geographic location of the project to the extent related to MBE/WBE availability, (iii) the scope of the work, (iv) the percentage of work available for subcontracting to MBE/WBEs and/or (v) other relevant factors, including a documented inability by the prospective General Bidder to obtain commitments from MBE/WBE subcontractors sufficient to meet the MBE/WBE goals after having made a **Diligent, Good Faith Effort** to do so. If these criteria are met the Awarding Authority must submit the General Bidders request along with all the foregoing documentation to the Executive Director of the Supplier Diversity Office (SDO) for final determination. Such documentation shall include, at a minimum, the following:

4. A list of all items of work under the Contract that the Bidder made available for subcontracting to MBE/WBEs. The Bidder shall identify all items of work, other than work to be performed by filed sub-Bidders, that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to MBE/WBEs.

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INSTRUCTION TO BID ATTACHMENTS

The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into scopes or tasks capable of being performed by MBE/WBEs.

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

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

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

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

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

10. If filed Sub-Bids are solicited for this Contract, requests from prospective general Bidders to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority no later than five (5) working days after the list of filed sub-Bidders is mailed by the Awarding Authority to persons who have taken out plans for the Contract. If there are no filed sub-Bids solicited for this Contract, requests to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority no later than ten (10) working days before the date set for the receipt of general Bids. THE AWARDING AUTHORITY WILL NOT CONSIDER ANY REQUEST TO REDUCE OR WAIVE THE MBE/WBE PARTICIPATION GOALS FOR THIS CONTRACT THAT IS RECEIVED AFTER THESE DEADLINES. <u>Any reduction or waiver of the MBE/WBE participation goals for this Contract will be made by written addendum mailed to all persons who have taken out plans for the project.</u>

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INSTRUCTION TO BID ATTACHMENTS

11. No later than five (5) working days after the opening of general Bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Affirmative Marketing Construction Officer (AMCO): (i) a completed Schedule for Participation by MBE/WBE ("Schedule for Participation") in the form provided by the Awarding Authority showing MBE/WBE participation in amounts equal to or exceeding the MBE/WBE participation goals for this Contract, (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each MBE/WBE listed in the Schedule for Participation, and (iii) a SDO most recent certification letter for each MBE/WBE listed in the Schedule of MBE/WBE Participation showing that the MBE/WBE is certified in the area of work for which it is listed on the Letter of Intent.

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

13. Within five (5) working days after receipt of the Schedule for MBE/WBE Participation, Letters of Intent, and SDO most recent certification letter, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule for MBE/WBE Participation and appropriate Letters of Intent and SDO most recent certification letter establishing that the MBE/WBE participation goal for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest eligible and responsible Bidder, subject to said Bidder's compliance with these conditions. If funds are insufficient to award to the second lowest Bidder, the project may have to be re-bid.

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

15. A filed sub-Bidder is not required to submit a Schedule of MBE/WBE Participation with its Bid. A filed sub-Bidder may, at its option, submit a Letter of Intent with its Bid if it is a SDO certified MBE/ WBE. If a filed sub-Bidder intends to sub-subcontract work to a SDO certified MBE/WBE, and the awarding authority permits limited sub-sub contracting for purposes of MBE/WBE participation, and the filed sub-Bidder wishes that sub-subcontract to be credited toward the participation goals for this Contract, the filed sub-Bidder should submit a Letter of Intent from that MBE/WBE with its Bid.

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FORMS FOR SUB BIDS

FORMS FOR SUBMISSION BY SUB BIDDERS

- ☐ Bid Form
- ☐ Certificate of Authority
- ☐ Bid Bond
- ☐ DCAMM Certificate of Eligibility
- ☐ DCAMM Update Statement

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FORMS FOR SUB BID

TO: All General Bidders Except those Excluded:

FROM:

_____
(Sub Bidder Name)

_____
(Address)

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(s) No. _____ of the specifications and in any plans specified in such Section, prepared by TBA Architects. Inc. for the Lt. Job Lane Elementary School Addition and Renovation Project Bedford, Massachusetts, for the contract sum of:

_____ Dollars ($_____)

Alternates:

No. 1	Renovation of Student Office, Nurse Suite, and Teachers Lounge	Add $ _____;	Subtract $
No. 2	Parking Lot/Loop Expansion and Playground	Add $ _____;	Subtract $

B. This Sub-bid includes Addenda numbered:

Addendum No._____ Date:_____ Addendum No._____ Date:_____

Addendum No._____ Date:_____ Addendum No._____ Date:_____

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 (5) days, Saturdays, Sundays and legal holidays excluded, after presentation of a sub-contract by the

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FORMS FOR SUB BID

General Bidder selected as the General Contractor, execute with such General Bidder a sub-contract in accordance with the terms of this Sub-Bid, contingent upon the execution of the general contract, and, if requested to do so in the General Bid by such General Bidder, who shall pay the premiums therefor, furnish a Performance and Payment Bond of a surety company qualifies to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority, in the full sum of the sub-contract 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 the 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 class or part thereof and the bid price for each 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 the 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 Authority.

F. The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore described plans, specifications, (including all GENERAL and SUPPLEMENTARY 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 projects with names of General Contractor and Architect/Engineer on which you served as Sub-Contractor for work of similar character as required for the above-named project.

Project	Architect/Engineer	Gen'l. Contractor	Amt. Of Contract
(a)			

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(b)_____
(c)_____
(d)_____

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 and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section forty-four F of Chapter 149, Massachusetts General Laws.

The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under 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, or any other applicable debarment provisions of any other chapter of the General Laws of any rule or regulation promulgated there under.

J. BIDDING CERTIFICATIONS AND AUTHORIZED SIGNATURE: The following certifications are required when submitting a bid. Submission of a signed bid form constitutes acknowledgement by the Bidder of compliance with each certifications.

1. LABOR: The undersigned hereby certifies under pains and penalties that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an amount no less than the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Industries and that he or she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work, and that he will comply fully with all laws and regulations applicable to awards made subject to Section 44A of Chapter 149 of the Massachusetts General Laws.

2. NON-COLLUSION CERTIFICATION: The undersigned certifies under penalties of perjury that this bid is in all respects *bona fide*, fair and made without collusion or fraud with any other person. As used in this Paragraph, the word "person" shall mean any natural person, joint venture, partnership, union, committee, club, corporation, or any other business or legal entity.

3. TAXES: As required by MGL Chapter 62c, §49A, the undersigned certifies that he or she has complied with all laws of the Commonwealth relating to taxes, reporting of employees and contractors, and withholding and remitting child support.

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4. DEBARMENT: The undersigned hereby certifies, under penalties of perjury, that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Chapter 29, §29 F, or any other applicable debarment provisions of any other Chapter of the General Laws, or any rule or regulation promulgated thereunder.

5. NONSEGREGATED FACILITIES: The undersigned hereby certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and tat he does not permit his employees to perform their services at any location, under his control where segregated facilities are maintained. The Bidder certifies further that he will not maintain or provide for employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location under his control where segregated facilities are maintained. The Bidder agrees that a breach of this certification will be a violation of the Equal Opportunity clause in any contract resulting from acceptance of this bid. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin, because of habit, local custom or otherwise. The Bidder agrees that (except where he has obtained identical certification from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractor prior to the award of subcontracts exceeding $10,000 which are not exempt from provisions of the Equal Opportunity clause, and that he will retain such certifications in his files.

   Note: The penalty for making false statements in offers is prescribed in 18 U.S. C. Section 1001.

I. MISCELLANEOUS PROVISIONS:

1. The Bidder acknowledges that the Awarding Authority has the right to reject any or all bids, and to waive informalities in the bidding.
2. This bid shall be valid and will not be withdrawn for a period of 30 days, Saturdays, Sundays, and legal holidays excluded, after the date designated for opening the bids.

By Sub-Bidder:

_____
(Firm Name)

_____
(Authorized Signature)

_____
(Printed name/Title)

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FORMS FOR SUB BID

(CORPORATE SEAL) _____
(Business Address)

_____
(City and State)

Date: _____

The Federal Social Security Identification Number of the Bidder (the number used on Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form, 941) is:

_____

If the Bidder is a Foreign Corporation, also state the following:

(b) The Power of Attorney required by General Laws, C. 181, §3 was filed on:

_____

(c) The Certificate and copy of its Charter, Articles, or Certificate of Incorporation required by General Laws, C. 181, §5 were filed on:

_____

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FORMS FOR SUB BID

CERTIFICATE OF AUTHORITY

(Corporations Only)

At a duly authorized meeting of the board of Directors of the_____ held on
(Name of Corporation)

_____ it was VOTED, that_____
(Date) (Name) (Officer)

of this company, be and he/she hereby is authorized to execute contracts and bonds in the name and on behalf of said company, and affix its corporate seal hereto; and such execution of any contract or obligation in this company's name on its behalf by such _____ under seal
(Officer)
of the company, shall be valid and binding upon this company.

A True Copy,
Attest: _____

Title: _____

Place of Business: _____

_____

Date of this Contract: _____

I hereby certify that I am the clerk of _____that_____
is the duly elected _____ of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as the date of this contract.

_____
(Clerk)

Corporate Seal

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PREVAILING WAGES

Prevailing Wages: See Wages Sheet #20160502-065, Attached separately
Certified Payroll reports: See Below

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PREVAILING WAGES

WEEKLY PAYROLL RECORDS REPORT & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c. 149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. For every week in which an apprentice is employed, a photocopy of the apprentice's identification card must be attached to the payroll report. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor, or public body shall furnish to the awarding authority directly, within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

STATEMENT OF COMPLIANCE

_____, 20_____

I,_____,_____
(Name of signatory party) (Title)

do hereby state:

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

_____ on the _____
(Contractor, subcontractor or public body) (Building or project)

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

Signature _____

Title _____

DIVISION OF OCCUPATIONAL SAFETY, 19 STANIFORD STREET, 2nd FLOOR, BOSTON, MA 02114

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MASSACHUSETTS WEEKLY CERTIFIED PAYROLL REPORT FORM

Company's Name:	Address:	Phone No.:	Payroll No.:

Employer's Signature:	Title:	Contract No:	Tax Payer ID No.	Work Week Ending:

Awarding Authority's Name:	Public Works Project Name:	Public Works Project Location:	Min. Wage Rate Sheet No.

General / Prime Contractor's Name:	Subcontractor's Name:	"Employer" Hourly Fringe Benefit Contributions

Employee Name & Complete Address	Work Classification:	Appr. Rate (%)	Hours Worked Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.	Project Hours (A) / All Other Hours	Hourly Base Wage (B)	Health & Welfare Insurance (C')	ERISA Pension Plan (D)	Supp. Unemp. (E)	Total Hourly Prev. Wage (F) (B+C+D+E)	Project Gross Wages (G) (A x F) / Total Gross Wages	Check No. (H)

NOTE: Pursuant to MGL Ch. 149 s.27B, every contractor and subcontractor is required to submit a "true and accurate" copy of their weekly payroll records directly to the awarding authority. Failure to comply may result in the commencement of a criminal action or the issuance of a civil citation.

Page _____ of _____

Date recieved by awarding authority
/ /

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Contract For:
Lt. Job Lane Elementary School Addition and Renovation
Bedford Massachusetts

THIS CONTRACT made the XXXth day of XXXX in the year 2016, by and between **TBD,** with a principal office at ADDRESS hereinafter called the "Contractor," and the Town of Bedford by and through its duly elected School Committee, with an address at Bedford Public Schools, 97 McMahon Road, Bedford, MA 01730, hereinafter called the "Awarding Authority" or "Owner":

WITNESSETH that the Contractor and the Awarding Authority for the consideration hereinafter named agree as follows:

ARTICLE 1 - SCOPE OF WORK:
The Contractor shall furnish all the material and perform all of the work shown on the Drawings and described in the Specifications entitled "Lt. Job Lane Elementary School Addition and Renovation" 66 Sweetwater, Bedford, MA 01730, prepared by the Town of Bedford Facilities Department and TBA Architects, Inc., dated May 11, 2016, and shall do everything required by this Contract, the General and Supplementary Conditions of the Contract, the Specifications, and the Drawings. The Contract Documents are fully incorporated herein and made a part hereof.

ARTICLE 2 - TIME AND COMPLETION:
The commencement work date shall be fixed in the "Notice to Proceed", issued by the Owner. On site work shall not commence before June 24, 2015 as described in Specifications. The Substantial Completion of all Work shall be August 1, 2017, as shown on the Drawings and stated in the "Notice to Proceed". If the Contractor fails to complete the work on that date, he shall pay the Awarding Authority, as liquidated damages, the sum of Two Hundred Dollars ($200.00) per day for each calendar day until the work is completed in accordance with the Contract Documents.

ARTICLE 3 - THE CONTRACT SUM:
The Awarding Authority shall pay the Contractor for the performance of the Contract, subject to additions and deductions provided therein in current funds as follows:

The Contract sum shall be **WRITE OUT AMOUNT ($xxxxx.xxx),** subject to additions and deductions as provided in the Contract Documents.

ARTICLE 4 - PROGRESS PAYMENTS:
Public building construction contracts; payments - M.G.L. c. 30, §39K:
Within fifteen days (30 days in the case of the commonwealth, including local housing authorities) after receipt from the Contractor, at the place designated by the Awarding Authority if such a place is designated, of a periodic estimate requesting payment in the amount due for the preceding month, the Awarding Authority will make a periodic payment to the Contractor for the work performed during the preceding month and for the materials not incorporated in the work but delivered and suitably stored at the site (or at some location agreed upon in writing) to which the Contractor has title or to which a subcontractor has title and has authorized the Contractor to transfer title to the Awarding Authority, upon certification by the Contractor that he is the lawful owner and that the materials are free from all encumbrances, but less (1) a retention based on its estimate of the fair value of its claim against the Contractor and less (2) a retention for direct payments to subcontractors

SAMPLE

based on demands for same in accordance with the provisions of section thirty-nine F, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment. After the receipt of a periodic estimate requesting final payment and within sixty-five days after (a) the Contractor fully completes the work or substantially completes the work so that the value of the work remaining to be done is, in the estimate of the Awarding Authority, less than one percent of the original contract price, or (b) the Contractor substantially completes the work and the Awarding Authority takes possession for occupancy, whichever occurs first, the Awarding Authority shall pay the Contractor the entire balance due on the contract less (1) a retention based on its estimate of the fair value of its claims against the Contractor and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, or based on the record of payments by the Contractor to the subcontractor under this contract if such record of payment indicates that the Contractor has not paid subcontractors as provided in section thirty-nine F. If the awarding authority fails to make a payment as herein provided, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscounted rate than charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until payment is delivered or mailed to the Contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days (twenty-four days in the case of the commonwealth) after receipt of such a periodic estimate from the Contractor, at the place designated by the Awarding Authority if such a place is so designated. The Contractor agrees to pay to each subcontractor a portion of any such interest paid in accordance with the amount due each subcontractor.

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

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

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

Notwithstanding the provisions of this section, at any time after the value of the work remaining to be done is, in the estimation of the Awarding Authority, less than 1 percent of the adjusted contract price, or the Awarding Authority has determined that the Contractor has substantially completed the work and the Awarding Authority

SAMPLE

has taken possession for occupancy, the Awarding Authority may send to the Contractor by certified mail, return receipt requested, a complete and final list of all incomplete and unsatisfactory work items, including for each item on the list, a good faith estimate of the fair and reasonable cost of completing such item. The Contractor shall then complete all such work items within 30 days of receipt of such list or before the contract completion date, whichever is later. If the Contractor fails to complete all incomplete and unsatisfactory work items within 45 days after receipt of such items furnished by the Awarding Authority or before the contract completion date, whichever is later, subsequent to an additional 14 days' written notice to the Contractor by certified mail, return receipt requested, the Awarding Authority may terminate the contract and complete the incomplete and unsatisfactory work items and charge the cost of same to the Contractor and such termination shall be without prejudice to any other rights or remedies the Awarding Authority may have under contract. The Awarding Authority shall note any such termination in the evaluation form to be filed by the Awarding Authority pursuant to the provisions of section 44D of chapter 149.

Completion of public works; semi-final and final estimates; payments; extra work; disputed items - M.G.L. c.30, §39G:

Upon substantial completion of the work required by a contract with the commonwealth, or any agency or political subdivision thereof, for the construction, reconstruction, alteration, remodeling, repair or improvement of public ways, including bridges and other highway structures, sewers and, water mains, airports and other public works, the Contractor shall present in writing to the Awarding Authority its certification that the work has been substantially completed. Within twenty-one days thereafter, the Awarding Authority shall present to the Contractor either a written declaration that the work has been substantially completed or an itemized list of incomplete or unsatisfactory work items required by the contract sufficient to demonstrate that the work has not been substantially completed. The Awarding Authority may include with such list a notice setting forth a reasonable time, which shall not in any event be prior to the contract completion date, within which the Contractor must achieve substantial completion of the work. In the event that the Awarding Authority fails to respond, by presentation of a written declaration or itemized list as aforesaid, to the Contractor's certification within the twenty-one day period, the Contractor's certification shall take effect as the Awarding Authority's declaration that the work has been substantially completed.

Within sixty-five days after the effective date of a declaration of a substantial completion, the Awarding Authority shall prepare and forthwith send to the Contractor for acceptance a substantial completion estimate for the quantity and price of the work done and all but one per cent retainage on that work, including the quantity, price and all but one per cent retainage, if held by the Awarding Authority, for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory work items and less the total periodic payments made to date for the work. The Awarding Authority also shall deduct from the substantial completion estimate an amount equal to the sum of all demands for direct payment filed by subcontractors and not yet paid to subcontractors or deposited in joint accounts pursuant to section thirty-nine F, but no contract subject to said section thirty-nine F shall contain any other provision authorizing the Awarding Authority to deduct any amount by virtue of claims asserted against the contract by subcontractors, material suppliers or others.

If the Awarding Authority fails to prepare and send to the Contractor any substantial completion estimate required by this section on or before the date herein above set forth, the Awarding Authority shall pay to the Contractor interest on the amount which would have been due to the Contractor pursuant to such substantial completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the Awarding Authority sends that substantial completion estimate to the Contractor for acceptance or to the date of payment therefore, whichever occurs first. The Awarding Authority shall include the amount of such interest in the substantial completion estimate.

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Within fifteen days after the effective date of the declaration of substantial completion, the Awarding Authority shall send to the Contractor by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory work items, and, unless delayed by causes beyond his control, the Contractor shall complete all such work items within forty-five days after the receipt of such list or before the then contract completion date, whichever is later. If the Contractor fails to complete such work within such time, the Awarding Authority may, subsequent to seven days' written notice to the Contractor by certified mail, return receipt requested, terminate the contract and complete the incomplete or unsatisfactory work items and charge the cost of same to the Contractor.

Within thirty days after receipt by the Awarding Authority of a notice from the Contractor stating that all of the work required by the contract has been completed, the Awarding Authority shall prepare and forthwith send to the Contractor for acceptance a final estimate for the quantity and price of the work done and all retainage, if held by the Awarding Authority, on that work less all payments made to date, unless the Awarding Authority's inspection shows that work items required by the contract remain incomplete or unsatisfactory, or that documentation required by the contract has not been completed. If the Awarding Authority fails to prepare and send to the Contractor the final estimate within thirty days after receipt of notice of completion, the Awarding Authority shall pay to the Contractor interest on the amount which would have been due to the Contractor pursuant to such final estimate at the rate hereinabove provided from the thirtieth day after such completion until the date on which the Awarding Authority sends the final estimate to the Contractor for acceptance or the date of payment therefore, whichever occurs first, provided that the Awarding Authority's inspection shows that no work items required by the contract remain incomplete or unsatisfactory. Interest shall not be paid hereunder on amounts for which interest is required to be paid in connection with the substantial completion estimate as hereinabove provided. The Awarding Authority shall include the amount of the interest required to be paid hereunder in the final estimate.

The Awarding Authority shall pay the amount due pursuant to any substantial completion or final estimate within thirty-five days after receipt of written acceptance for such estimate from the Contractor and shall pay interest on the amount due pursuant to such estimate at the rate hereinabove provided from that thirty-fifth day to the date of payment. Within 15 days, 30 days in the case of the commonwealth, after receipt from the Contractor, at the place designated by the Awarding Authority, if such place is so designated, of a periodic estimate requesting payment of the amount due for the preceding periodic estimate period, the Awarding Authority shall make a periodic payment to the Contractor for the work performed during the preceding periodic estimate period and for the materials not incorporated in the work but delivered and suitably stored at the site, or at some location agreed upon in writing, to which the Contractor has title or to which a subcontractor has title and has authorized the Contractor to transfer title to the Awarding Authority, upon certification by the Contractor that he is the lawful owner and that the materials are free from all encumbrances. The Awarding Authority shall include with each such payment interest on the amount due pursuant to such periodic estimate at the rate herein above provided from the due date. In the case of periodic payments, the contracting authority may deduct from its payment a retention based on its estimate of the fair value of its claims against the Contractor, a retention for direct payments to subcontractors based on demands for same in accordance with the provisions of section thirty-nine F, and a retention to secure satisfactory performance of the contractual work not exceeding five per cent of the approved amount of any periodic payment, and the same right to retention shall apply to bonded subcontractors entitled to direct payment under section thirty-nine F of chapter thirty; provided, that a five per cent value of all items that are planted in the ground shall be deducted from the periodic payments until final acceptance.

No periodic, substantial completion or final estimate or acceptance or payment thereof shall bar a contractor

SAMPLE

from reserving all rights to dispute the quantity and amount of, or the failure of the Awarding Authority to approve a quantity and amount of, all or part of any work item or extra work item.

Substantial completion, for the purposes of this section, shall mean either that the work required by the contract has been completed except for work having a contract price of less than one per cent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract.

ARTICLE 5 – DIRECT PAYMENT:

Construction contracts; assignment and subrogation; subcontractor defined; enforcement of claim for direct payment; deposit, reduction of disputed amounts - M.G.L. c. 30, §39F):

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

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

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

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

SAMPLE

reply shall contain a detailed breakdown of the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the subcontractor.

(e) Within fifteen days after receipt of the demand by the Awarding Authority, but in no event prior to the seventieth day after substantial completion of the subcontract work, the Awarding Authority shall make direct payment to the subcontractor of the balance due under the subcontract including any amount due for extra labor and materials furnished to the Contractor, less any amount (i) retained by the Awarding Authority as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the Contractor in the sworn reply; provided, that the Awarding Authority shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by subparagraph (d). The Awarding Authority shall make further direct payments to the subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this subparagraph.

(f) The Awarding Authority shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of subparagraph (e) in an interest-bearing joint account in the names of the Contractor and the subcontractor in a bank in Massachusetts selected by the Awarding Authority or agreed upon by the Contractor and the subcontractor and shall notify the Contractor and the subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the Contractor and the subcontractor or as determined by decree of a court of competent jurisdiction.

(g) All direct payments and all deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to subparagraph (f) shall be made out of amounts payable to the Contractor at the time of receipt of a demand for direct payment from a subcontractor and out of amounts which later become payable to the Contractor and in the order of receipt of such demands from subcontractors. All direct payments shall discharge the obligation of the Awarding Authority to the Contractor to the extent of such payment.

(h) The Awarding Authority shall deduct from payments to a Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to subparagraph (f), are sufficient to satisfy all unpaid balances of demands for direct payment received from subcontractors. All such amounts shall be earmarked for such direct payments, and the subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

(i) If the subcontractor does not receive payment as provided in subparagraph (a) or if the Contractor does not submit a periodic estimate for the value of the labor or materials performed or furnished by the subcontractor and the subcontractor does not receive payment for same when due less the deductions provided for in subparagraph (a), the subcontractor may demand direct payment by following the procedure in subparagraph (d) and the Contractor may file a sworn reply as provided in that same subparagraph. A demand made after the first day of the month following that for which the subcontractor performed or furnished the labor and materials for which the subcontractor seeks payment shall be valid even if delivered or mailed prior to the time payment was due on a periodic estimate from the Contractor. Thereafter the Awarding Authority shall proceed as provided in subparagraph (e), (f), (g) and (h).

(2) Any assignment by a subcontractor of the rights under this section to a surety company furnishing a bond

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under the provisions of section twenty-nine of chapter one hundred forty-nine shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the Awarding Authority or which are on deposit pursuant to subparagraph (f) of paragraph (1) shall be subordinate to the rights of all subcontractors who are entitled to be paid under this section and who have not been paid in full.

(3) "Subcontractor" as used in this section (i) for contracts awarded as provided in sections forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall mean a person who files a sub-bid and receives a subcontract as a result of that filed sub-bid or who is approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor, (ii) for contracts awarded as provided in paragraph (a) of section thirty-nine M of chapter thirty shall mean a person approved by the Awarding Authority in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the Contractor, and (iii) for contracts with the commonwealth not awarded as provided in forty-four A to forty-four H, inclusive, of chapter one hundred forty-nine shall also mean a person contracting with the Contractor to supply materials used or employed in a public works project for a price in excess of five thousand dollars.

(4) A Contractor or a subcontractor shall enforce a claim to any portion of the amount of a demand for direct payment deposited as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the other and the bank shall not be a necessary party. A subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in subparagraph (f) of paragraph 1 by a petition in equity in the superior court against the Awarding Authority and the Contractor shall not be a necessary party. Upon motion of any party the court shall advance for speedy trial any petition filed as provided in this paragraph. Sections fifty-nine and fifty-nine B of chapter two hundred thirty-one shall apply to such petitions. The court shall enter an interlocutory decree upon which execution shall issue for any part of a claim found due pursuant to sections fifty-nine and fifty-nine B and, upon motion of any party, shall advance for speedy trial the petition to collect the remainder of the claim. Any party aggrieved by such interlocutory decree shall have the right to appeal therefrom as from a final decree. The court shall not consolidate for trial the petition of any subcontractor with the petition of one or more subcontractors or the same general contract unless the court finds that a substantial portion of the evidence of the same events during the course of construction (other than the fact that the claims sought to be consolidated arise under the same general contract) is applicable to the petitions sought to be consolidated and that such consolidation will prevent unnecessary duplication of evidence. A decree in any such proceeding shall not include interest on the disputed amount deposited in excess of the interest earned for the period of any such deposit. No person except a subcontractor filing a demand for direct payment for which no funds due the Contractor are available for direct payment shall have a right to file a petition in court of equity against the Awarding Authority claiming a demand for direct payment is premature and such subcontractor must file the petition before the Awarding Authority has made a direct payment to the subcontractor and has made a deposit of the disputed portion as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1).

(5) In any petition to collect any claim for which a subcontractor has filed a demand for direct payment the court shall, upon motion of the Contractor, reduce by the amount of any deposit of a disputed amount by the Awarding Authority as provided in part (iii) of subparagraph (e) and in subparagraph (f) of paragraph (1) any amount held under a trustee writ or pursuant to a restraining order or injunction.

ARTICLE 6 - SUBCONTRACTORS:

The Contractor shall employ the following Subcontractors at the amounts listed below:

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Sub-Trade	Sub-Bidder	Bonds Required (Yes or No)	Contract Sum
Roofing and Flashing	TBD	TBD	TBD
Metal Windows	TBD	TBD	TBD
Acoustical Tile	TBD	TBD	TBD
Tile	TBD	TBD	TBD
Resilient Floors	TBD	TBD	TBD
Glass and Glazing	TBD	TBD	TBD
Painting	TBD	TBD	TBD
Plumbing	TBD	TBD	TBD
Heating, Ventilating and Air-Conditioning	TBD	TBD	TBD
Electrical	TBD	TBD	TBD
Masonry	TBD	TBD	TBD
Fire Protection	TBD	TBD	TBD

ARTICLE 7 - ALTERNATES:
The disposition of alternate proposals is as follows:

TBD

ARTICLE 8 - INCORPORATION OF STATUTES BY REFERENCE:
Insofar as they are applicable the statutes of the Commonwealth of Massachusetts in any way relating to the construction, alteration, repair and installation of public buildings, particularly with reference to labor, shall be strictly complied with by the Contractor and it is understood that all such statutes are incorporated by reference in this Contract.

ARTICLE 9 - TIME IS OF THE ESSENCE:
Inasmuch as the performance of this Contract and the completion of the work described herein are for the purpose of upgrading the facility in accordance with a predetermined program, all provisions relating to time of completion of the work are of the strict essence of this Contract.

ARTICLE 10 - FINAL INSPECTION:
Upon receipt of a written notice that the project described herein is ready for final inspection and acceptance, the Designer shall promptly make such inspection and when he/she finds the work acceptable under the Contract and the Contract fully performed, he/she shall promptly issue a final certificate over his/her own signature, stating that the work provided for in the Contract has been completed and is accepted by him/her under the terms and conditions thereof and that the entire balance found to be due the Contractor and noted in said final certificate is due and payable. Before issuance of a final certificate the Contractor shall submit evidence satisfactory to the Designer and the Awarding Authority that all payrolls, materials bills and other expenses connected with the project have been paid, and that all Subcontractors have been paid in accordance

SAMPLE

with Articles 4 and 5 of this Contract.

ARTICLE 11 - COMMITTEE MEMBERS NOT PERSONALLY LIABLE:
It is hereby expressly agreed that the members of the Town of Bedford Selectmen and the officials, agents, representatives, volunteers, servants, and employees of the Town of Bedford are not personally liable in any way under or arising out of this Contract and the Contract Documents or as to any representation pertaining to said Contract and Contract Documents.

ARTICLE 12 - SUB-SURFACE LATENT CONDITION (M.G.L. c. 30, § 39N):
If, during the progress of the work, the Contractor or the Awarding Authority discovers that the actual sub-surface of latent physical conditions encountered at the site differ substantially or materially from those shown on the Drawings or indicated in the Contract Documents, either the Contractor or the contracting authority may request an equitable adjustment in the contract price of the Contract applying to work affected by the differing site conditions. A request for such adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such claim from a Contractor, or upon its own initiative, the contracting authority shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the Drawings or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the Drawings and Contract Documents and are of such nature as to cause an increase or decrease in the cost of performance of the work or a change in the construction methods required for the performance of the work which results in an increase or decrease in the cost of the work, the contracting authority shall make an equitable adjustment in the Contract price and the Contract shall be modified in writing accordingly.

ARTICLE 13 - REVENUE ENFORCEMENT & PROTECTION PROGRAM ACT:
Pursuant to M.G.L. c. 62C, §49A, the undersigned Contractor hereby certifies, under penalties of perjury, that the Contractor named herein is in compliance with and shall remain in compliance with all laws of the Commonwealth of Massachusetts pertaining to taxes, reporting of employees and contractors, and withholding and remitting of child support.

ARTICLE 14 - RECORD KEEPING: (M.G.L.c.30, § 39R):

1. This Contractor shall make, and keep for at least six years after final payment, books, records, and accounts which, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the Contractor, and;

2. Until the expiration of six years after final payment, the office of the Inspector General, the Commissioner of Capital Asset Management and Maintenance, and the Awarding Authority shall have the right to examine and copy any books, documents, papers or records of the Contractor or of his/her subcontractors that directly pertain to, and involve transactions relating to, the Contractor or his/her subcontractors.

3. All recordkeeping shall be in full compliance with Massachusetts General Laws, Chapter 30, Section 39R.

4. The Contractor shall describe any change in the method of maintaining records or recording transactions which materially affect any statements filed with the Awarding Authority, including in his description the date of the change and reasons therefore, and shall accompany said description with a letter from the Contractor's independent certified public accountant approving or otherwise commenting on the changes, and the Contractor has filed a statement of management on internal accounting controls as set forth in M.G.L. c. 30, § 39R paragraph c. prior to the execution of the Contract, and, the Contractor has filed prior

SAMPLE

to the execution of the Contract and will continue to file annually, an audited financial statement for the most recent completed fiscal year as set forth in M.G.L. c. 30, § 39R paragraph d.

ARTICLE 15- WORK SUSPENSION, DELAY OR INTERUPTION (M.G.L. c. 30, 390):

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

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

In the event a suspension, delay, interruption or failure to act of the Awarding Authority increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the Contractor for payment for an increase in the cost of his performance as provisions 15.1 and 15.2 give the Contract against the Awarding Authority, but nothing in provisions 15.1 and 15.2 shall in any way change, modify or alter any other rights which the Contractor or the Subcontractor may have against each other.

ARTICLE 16- CERTIFICATIONS

The Contractor hereby certifies that:

(i) If an individual, the individual is a registered professional;

(ii) If a partnership, a majority of all the partners are persons who are registered professionals;

(iii) If a corporation, sole proprietorship, joint stock company or other entity, the majority of the directors or a majority of the stock ownership and the chief executive officer are persons who are registered professionals, and the person to have the project in his or her charge is a registered professional; or

(iv) If a joint venture, each joint venturer satisfies the requirements of the Massachusetts General Laws.

The Contractor hereby certifies that it has not been given, offered or agreed to give any person, corporation or other entity any gift, contribution or offer of employment as an inducement for or in connection with, the award of this contract.

The Contractor hereby certifies that no consultant to or subcontractor for the Contractor has given, offered or agreed to give any gift, contribution or offer of employment to the Contractor, or to any other person, corporation or entity as an inducement for, or in connection with, the award to the consultant or subcontractor of a contract by the Contractor.

SAMPLE

The Contractor hereby certifies that no person, corporation or other entity, other than a bona fide full time employee of the Contractor, has been retained or hired by the Contractor to solicit for or in any way assist the Contractor in obtaining this contract upon an agreement or understanding that such person, corporation or other entity be paid a fee or other consideration contingent upon the award of this Contract to the Contractor.

Pursuant to M.G.L. c. 30, § 39S, the Contractor hereby certifies: (1) that it 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) 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 ten (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

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

The Contractor hereby certifies that its entry into this Contract is bona fide, is in good faith, and is not in fraud or collusion with any other person.

The Contractor hereby certifies that it is in compliance with and shall remain in compliance with the Commonwealth's Conflict of Interest Law, M.G.L. c. 268A.

The Contractor hereby certifies, under penalties of perjury, that it is not presently debarred from doing public construction work in the Commonwealth under the provisions of Chapter 29, Section 29F, or any other applicable debarment provisions of any other chapter of the General Laws, or any rule or regulation promulgated there under.

The Contractor shall comply with all laws and regulations of the Commonwealth including, but not limited to, any and all dig safe and trench regulations and M.G.L. c. 149, § 34, and all such laws and regulations of the Commonwealth shall be deemed incorporated and made fully a part hereof.

The Contractor acknowledges relevant language from M.G.L. c. 149, §44G, as applicable.

The Contractor hereby certifies that prevailing wage rates will be paid to all persons performing work under this Contract and that it shall comply with the prevailing wage statutes, M.G.L. c. 149, §§ 26-27H.

The Contractor hereby certifies that it has visited the project site and has familiarized itself with existing conditions. Lack of knowledge of on-site conditions shall not be cause for changes to the Contract sum.

The Contractor acknowledges M.G.L. c. 44, §31C:"No contract for the construction, reconstruction,

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alteration, remodeling, repair or demolition of any public building or public work by any city or town costing more than two thousand dollars shall be deemed to have been made until the auditor or accountant or other officer of the city or town having similar duties has certified thereon that an appropriation in the amount of such contract is available therefor and that an officer or agent of the city, town or Awarding Authority has been authorized to execute said contract and approve all requisitions and change orders. No order to the contractor for a change in or addition to the work to be performed under a contract subject to this section, whether in the form of a drawing, plan, detail or any other written instruction, unless it is an order which the contractor is willing to perform without any increase in the contract price, shall be deemed to have been given until the auditor or accountant, or other officer of the city or town having similar duties, has certified thereon that an appropriation in the amount of such order is available therefor; but such certificate shall not be construed as an admission by the city or town of its liability to pay for such work. The certificate of the auditor or accountant or other officer of the city or town having similar duties, that an appropriation in the amount of such contract or order is available shall bar any defense by the city or town on the grounds of insufficient appropriation; and any law barring payment in excess of appropriations shall not apply to amounts covered by any certificate under this section."

ARTICLE 17- ENTIRE AGREEMENT:

This Contract contains the entire agreement between the parties. There are no inducements, promises, covenants, terms, conditions, or obligations entered into by the parties other than contained herein. This agreement shall be amended or modified only by written instruments executed by the parties hereto.

ARTICLE 18 - SEVERABILITY:

If any provision of this Contract is determined to be invalid by a court of competent jurisdiction, it shall not affect the remaining provisions of said Contract, but said remaining provisions shall be binding and effective to the parties.

ARTICLE 19 - SUCCESSORS, HEIRS, AND ASSIGNS:

The Contract shall be binding upon and inure to the benefit of the heirs, assigns, or successors in interest of the parties.

ARTICLE 20 - GOVERNING LAW:

This Contract shall be construed in accordance with the laws of the Commonwealth of Massachusetts, notwithstanding any choice of law principles otherwise applicable.

ARTICLE 21 – NON-COLLUSION:

By entering into this Contract, the Contractor hereby certifies, under penalties of perjury, that its bid or proposal was made in good faith and without fraud or collusion with any person. As used in this certification, the word "person" shall mean, without limitation, a natural person, business, partnership, corporation, union, committee, club, or other organization, organization, entity, or group of individuals.

ARTICLE 22 - INDEMNIFICATION:

The Contractor further agrees to indemnify, defend (with counsel deemed acceptable by the Awarding Authority), and hold harmless the Awarding Authority, including its past, present and future officials, agents, volunteers, servants, employees and representatives, from and against any and all claims, damages, debts, rights, actions, causes of action, losses, costs and expenses, including attorney fees, arising out of or resulting from the performance of the work contemplated by this Contract, provided that any such claim, damages, debt, right, action, cause of action, cost, loss or expense: (a) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself) including the loss of use

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resulting therefrom and (b) is caused in whole or in part by any negligent act or omission of the Contractor or Subcontractor, any one directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. The Contractor shall be responsible for all damage or injury to property during the prosecution of the work resulting from any act, omission, neglect or misconduct in the manner of method of executing the work or due to defective work or materials. In any and all claims against the Awarding Authority or any of its officials, agents, volunteers, servants, representatives or employees, by employees of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of the may be liable, the indemnification obligation shall not be limited in any way by any limitation by or for the Contractor or any Subcontractor under Workmen's Compensation Acts, disability benefits acts, or other employee benefit acts. The obligation of the Contractor shall not extend to the liability of the Awarding Authority, and its agents or employees arising out of (a) the preparation or approval of Maps, Drawings, Opinions, Reports, Surveys, Change Orders, Designs or Specifications, or (b) the giving of or the failure to give directions or instructions by the Awarding Authority, and its agents or employees, provided such giving or failure to give directions or instructions is the primary cause of the injury or damage. The intent of the Specifications in regards to insurance is to specify minimum coverage and minimum limits of liability acceptable under the Contract. However, is shall be the Contractor's responsibility to purchase and maintain insurance of such character and in such amounts as will adequately protect it and the Awarding Authority (officials, agents, volunteers, servants, employees and representatives) from and against all claims, damages, debts, rights, actions, causes of action, losses, costs and expenses resulting from exposure to any casualty liability in the performance of the work and naming the Town of Bedford as an additional insured on any insurance policy required to be obtained and maintained. The Contractor shall continuously maintain adequate protection for all work from damage and shall protect the property of the Awarding Authority and others, including adjacent property, from injury or loss arising in connection with the Contract. The Contractor shall make good any such damage, injury, debt, cost or loss except as may be directly due to errors in the Contract Documents or caused by agents or employees of the Awarding Authority, or due to cause beyond the Contractor's control and not the Contractor's fault or negligence.

IN WITNESS WHEREOF, inhabitants of the Town of Bedford and TBD have caused these presents to be executed, under seal by its duly elected Selectmen, and an officer of the aforementioned company/corporation, respectively, all hereunto duly authorized, the day and year first above written.

Bedford Public Schools, School Committee:

Chairperson _____

Member _____

Member _____

Member _____

Member _____

SAMPLE

By: _____

General Contractor's Social Security or Federal ID Number

Signature, General Contractor

_____

_____

Printed Name and Title

Certification of Funds:

I hereby certify that an appropriation in the amount of this Contract is available.

_____

Accountant for the Town of Bedford

Approved as to matters of form:

_____

Counsel for the Town of Bedford

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GENERAL CONDITIONS

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Project Information:

Project: Lt. Job Lane Elementary School Addition and Renovation Project
66 Sweetwater Avenue
Bedford, Massachusetts

Owner Representative
: Town of Bedford
Taissir Alani, Director of Facilities
101 McMahon Road
Bedford, Massachusetts 01730

Designer: TBA Architects, Inc.
Justin Humphreys
43 Bradford Street, Suite 300
Concord, MA 01742

A. IN GENERAL

01. DEFINITIONS:

1. The Contract Documents consist of the Invitation for Bids, Instructions to Bidders, completed Bid Proposal Forms, completed Contract Forms, General Conditions, Supplementary Conditions, Specifications, Drawings, and all addenda issued during the bidding period, other documents listed in the agreement and modifications issued after execution of the Contract. These form the Contract.

2. The Awarding Authority, the Contractor and the Designer are those mentioned as such in the Contract Documents. They are treated throughout the Contract Documents as if each were of the singular number and masculine gender.

3. The term Subcontractor, as employed herein, includes only those having a direct contract with the Contractor and it includes one who furnishes material worked to a special design according to the Drawings or Specifications of this Work, but does not include one who merely furnishes material not so worked.

4. "Written notice" shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by certified mail or by a form of overnight delivery, to the last business address known to him who gives the notice.

5. "Work" of the Contractor or Subcontractor (whether in whole or in part) includes labor and/or materials, equipment, and services provided or to be provided by them to complete the Project requirements, including separate Contractors or the Owner.

6. The "Date of Substantial Completion" (Contract Time) of a project or specified area of a project is the date when construction is sufficiently completed, in accordance with the Contract Documents, as modified by any Change Orders agreed to by the parties, so that the Awarding Authority can legally occupy the project or specified area of the project for the use it was intended.

7. "Final Completion" is the date of acceptance of the Project by the Awarding Authority. This represents that all Work, all required close-out documents, Drawings, warranties, etc. have been accepted and are in the Owner's possession. This date shall not exceed the Substantial Completion date by more than thirty (30) calendar days unless modified by Change Order.

8. The "Owner" means the Awarding Authority, the Owner or the Owner's authorized representative as defined in the Instructions to Bid.

9. The "Owner's Representative" means the Town of Bedford Director of Facilities.

10. The "Awarding Authority" means the Bedford Public Schools, acting by and through its duly elected School Committee.

11. The "Designer" means TBA Architects, Inc. 43 Bradford Street Concord, MA 01742.

12. The "Contractor" unless especially noted or evident to the contrary, the "Contractor" as used in these specifications signifies the Bidder awarded the Lt. Job Lane Elementary School Addition and Renovation Project.

13. The "General Contractor" is TBD, with a principal office at ADDRESS.

14. "Bidder" - A Bidder is a person or entity who submits a Bid.

02. All CONTRACTS SUBJECT TO APPROPRIATION:

The execution of a contract is subject to adequate financial appropriations in accordance with M.G.L. c.44, §31C for the item(s) or project(s) advertised. The lack of adequate financial appropriation by the Town for the bid item(s) or project(s) constitutes grounds to reject all bids or those bids, contracts, requisitions or change orders that exceed the financial limitations imposed by Bedford's Town Meeting.

03. CONTRACTOR'S SIGATURE:

The Contractor's signature, in ink, on the bid proposal form and Contract will be held as evidence that he/she has familiarized himself/herself with all requirements for proper execution of the project.

04. COMMUNICATIONS:

The Designer shall be the intermediary between the Awarding Authority and the Contractor, and his Consultants and the Contractor. All communications between the Awarding Authority and the Contractor, and the Designer's Consultants and the Contractor, shall be through the Designer unless written authorization by the Awarding Authority and the Designer provides for direct communication. Subcontractors and material suppliers shall communicate through the Contractor. Contractors performing work under "Separate Contracts" shall communicate with the Awarding Authority directly unless their Contracts direct differently.

Designer Contact Information:

TBA Architects, Inc.
Justin Humphreys
20 Conant Street
Danvers, MA 01923

Phone (781) 893-5828, Fax (781) 893-5834

05. GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES (MBE) AND WOMEN BUSINESS ENTERPRISES (WBE) (EXECUTIVE ORDER 390, M.G.L. c. 7, s. 4)

The Owner hereby notifies all bidders that minority business enterprises and women business enterprises will be afforded full opportunity to submit bids in response to the Invitation for Bids and will not be discriminated against on the grounds of race, color, religious creed, sex, handicap, gender identity, sexual orientation (which shall not include persons whose sexual orientation involves minor children as the sex object), genetic information, ancestry, age, or national origin, or any other prohibited basis of discrimination named in Massachusetts state law (including M.G.L. c. 151B) or under federal law, in consideration for an award. As part of the obligation of remedial action under the foregoing statement, the successful bidder shall endeavor to maintain not less than a Combined MBE/WBE Goal of 10.4% ratio of minority and women employee man-hours to total man-hours on this project.

The apparent low bidder for a project will submit within five (5) working days after the bids have been open their MBE and WBE Schedule of Participation for the project, along with each Subcontractor's letters of Intent, and the Supplier Diversity Office's ("SDO") most recent certification letter. The Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule for MBE and WBE participation and appropriate Letters of Intent and the SDO's most recent certification letter establishing that the MBE and WBE participation goal for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract. The Awarding Authority will then award the Contract to the second lowest eligible and responsible Bidder, subject to said Bidder's compliance with these conditions. If funds are insufficient to award to the second lowest Bidder, the project may have to be re-bid.

06. FOREIGN CORPORATIONS:

The Contractor (and Subcontractors as defined in paragraph A.01.3. above), if a foreign corporation, shall comply with the applicable provisions under Massachusetts law (M.G.L. c.30 § 39L).

07. ANTI-BOYCOTT COVENANT:

The Contractor warrants, represents and agrees that during the time the Contract is in effect, neither it nor any affiliated company, as hereinafter defined, participates in or cooperates with any international boycott, as defined in Section 999(b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engages in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws. If there shall be a breach in the warranty, representation and agreement contained in this paragraph, then without limiting such other rights as if may have, the Owner shall be entitled to rescind this Contract. As used herein, affiliated company shall be any business entity of which at least fifty-one (51%) percent of the ownership interest of the Contractor, or which directly or indirectly owns at least fifty-one (51%) percent of the ownership interests of the Contractor.

08. EXECUTIVE ORDER NO. 195:

The Governor or his designee, the Secretary of Administration and Finance, and the State Auditor, or his designee, shall have the right at reasonable times and upon reasonable notice to examine the books, records, and other compilations of data of the Contractor(s) and Sub-Contractor(s) which pertain to the performance of the provisions and requirements of the Contract.

09. MATERIALS:

1. Preference in Supplies and Materials

Your attention is directed to the provision of Massachusetts General Laws Chapter 7, Section 22, which reads as follows in Clause 17 of said Section 22:"[a] preference in the purchase of supplies

and materials, other consideration being equal, in favor, first, of supplies and materials manufactured and sold within the commonwealth; . . . and second, of supplies and materials manufactured and sold elsewhere within the United States."

2. Or Equal

An item shall be considered equal if, in the opinion of the Awarding Authority: (1) it is at least equal in quality, durability, appearance, strength and design, (2) it will perform at least equally the function imposed by the general design for the public work being contracted for or the material being purchased, and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the said specifications. For each item of material the specifications shall provide for either a minimum of three (3) named brands of material or a description of material which can be met by a minimum of three (3) manufacturers or producers, and for the equal of any one (1) of said name or described materials.

3. Substitutions
   a. After the Contract for Construction has been executed, the Owner and the Designer will consider substitutions of products in place of those specified, but only when the substitution will provide a clear benefit to the Owner, such as the same performance and quality at a lower cost, or better performance or quality at the same cost, or an improved construction schedule, or when the specified products is no longer being manufactured, or as permitted by M.G.L. Ch. 30, §39M(b).
   b. The proposed product must meet the standards of quality, performance, durability, appearance, strength and design quality and performance set by the named or described product or products, including but not limited to such characteristics as capacity, performance, size, available selection of colors, ease of maintenance, ability to interface with other components of the Work, and such other characteristics as the Designer considers essential the design intent.
   c. Submit a formal, written request for substitution. Substitutions indicated on or implied by submittal of shop drawings or manufacturers product data, will not be accepted, even if the Designer inadvertently "approves" the submittal.
   d. Submit a separate written request for each product, supported with product data, with drawings and samples as appropriate, and with the following information:
      1. Comparison of the qualities of the proposed substitution with those of the product specified.
      2. Changes required in other components of the Work because of the substitution
      3. Effect on the construction schedule and on the Contract Sum.
      4. Cost data comparing the proposed substitution with the product specified, and including incidental cost of modifications to related work.
      5. License fees or royalties, if applicable.
      6. Availability of maintenance service and source of replacement materials.
   e. By making a request for a substitution, the Contractor makes the following representations:
      1. The Contractor has investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified.
      2. The Contractor, Manufacturer and Installer (as applicable) can and will provide at least the same warranty for the substitution that the specifications require for the product specified.
      3. The cost data presented is completed and includes all adjustments to the Contract Price for the substitution and related work under this Contract, and the Contractor will make no claims for additional costs related to the substitution which subsequently become apparent.
      4. The Contractor will coordinator the installation of the accepted substitute, making such

changes as may be required for the Work to be complete in all respects,

f. If requested by the Designer, provide additional evidence leading to a reasonable certainly that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable.

g. Timing: When the Contractor requests a substitution, the Designer requires more time to review the submittal, in order to evaluate the proposed substitution. Particularly on major items of work, the Contractor submit requests for substitutions in a timely fashion, well in advance of the time at which the product has to be ordered, allowing sufficient time for Designer's Review. No Change Order shall be submitted or approved on account of the Contractor's failure to timely submit a request for substitution.

h. The Designer will review the proposed substitution for appearance, where relevant, as well as for performance, quality of construction, consistency with design intent, and consistency with this paragraph A.09.3, and shall be the final judge of the acceptability of the proposed substitution.

1. The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building which are exposed to view, including visible items of mechanical and electrical equipment, have been selected to have coordinated design. The Designer will judge proposed substitutions for their appearance and design as well as for other more objective characteristics such as measurable performance. If the product proposed as a substitution cannot be furnished in the color, finish, texture, or pattern specified, that will be sufficient grounds for rejection of a proposed substitution.

i. If the substitution is accepted, assume responsibility for coordinating the substitution with the other work, including the work of other trades, and for incidental costs.

4. Department Inspection and Tests

Any material to be used and in the Work may be tested or inspected at any time by the Owner and may be rejected if it fails to comply with specified tests, or if it shall appear not to be first quality material or workmanship.

5. Unsatisfactory Materials

All materials furnished and used shall be new and of best quality available. Any material not meeting the approval of the Owner will be rejected and shall be removed from the facility grounds by the Contractor, at no expense to the Owner.

6. Submittals

Required submittals are listed for each section in Part B Technical Specifications of the Project Manual.

10. TAX EXEMPTION NUMBER:

The successful bidder will be provided with a tax-exempt number in accordance with the provisions of M.G.L. c. 64I to M.G.L. c. 64H, or the purchase of materials and supplies to be used or incorporated in the performance of this Contract for the Town of Bedford.

11. NON-DISCRIMINATION ARTICLE:

During the performance of this contract, the Contractor, for himself/herself, his/her assignees and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

1. In connection with performance of work**:** under this Contract, the Contractor agrees not to discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age, ancestry, sex, physical or mental handicap, sexual orientation, which shall not include persons who sexual orientation involves minor

children as the sex object, children, veteran status, or membership in the armed forces, genetic information, gender identity, or any other basis protected under Federal or Massachusetts law. The aforesaid provisions shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms or compensation; conditions or privileges or employment; and selection for training; including apprenticeship. The Contractor agrees to post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the fair employment practice law of the Commonwealth.

2. Non-Discrimination**:** The Contractor, in the performance of all work after award, and prior to completion of the Contract Work, shall not discriminate on grounds of practices or in the selection or retention of sub-contractors, and in the procurement of materials and rental of equipment.

12. IMPLIED AND OTHER REQUIREMENTS:

Should any work or material be required or any compliance with laws of the Commonwealth which is not detailed in the specifications or on the plans either directly or indirectly, but, which is nevertheless necessary for the proper carrying out of the intent thereof, the Contractor is to understand the same to be implied and required, and shall perform all such work, furnish any such material, and comply with any such laws as fully as if they were particularly delineated or described. The Contractor must cooperate and coordinate with Owner's Representative regarding work to be done to properly execute this Contract.

B. CONTRACT DOCUMENTS

01. CONTRACT REQUIREMENTS:

1. Within five (5) working days after notice of award and receipt of Contract forms from the Awarding Authority, the bidder to whom the contract is awarded shall sign and deliver them to the Awarding Authority along with the Performance Bond, Labor and Material Payment Bond, Corporate Vote, Certificate of Insurance, Statement of Management and Financial Statement required by the Contract Documents.

2. Subcontractors who are included under Item 2, paragraph C. of the Form for General Bid will, after final selection by the Awarding Authority, be entered under Article 6 of the Contract Form, and their Subcontractors, when listed under Paragraph E. of the Form for Sub-bid, shall be understood to be included in the Contract. The Contractor shall make no award of any Subcontracts and his Subcontractors shall not sublet portions of their work except as herein described without the written approval of the Designer.

3. The General Contractor shall prepare Subcontracts for all Subcontractors listed in Item 2, paragraph D. of the Form for General Bid in accordance with forms contained in the Massachusetts General Laws, Chapter 149, § 44F and shall submit copies of signed Subcontracts for inclusion into signed Contract Sets.

4. All time limits stated in the Contract Documents are of the strict essence of the Contract.

02. CONTRACTOR'S LIABILITY INSURANCE:

1. The Contractor shall provide and maintain insurance at its own expense during the life of this contract, issued by (a) responsible company(ies) authorized to do business in Massachusetts.
2. The insurance required by the above subparagraph 1 shall be written for not less than the following minimum limits of liability:
   a. Workers Compensation Insurance - as required by the law of the Commonwealth of Massachusetts

b. Employer's Liability Insurance – with limits of at least $1,000,000.00 for each occurrence and at least $1,000,000.00 in the aggregate.
c. Comprehensive General Liability Insurance – with limits of at least $1,000,000.000 for each occurrence and at least $2,000,000.00 in the aggregate. The Town must be named as an additional insured under this policy.
d. Property Damage Liability Insurance - with limits of at least $1,000,000.00 for each occurrence and at least $1,000,000.00 in the aggregate.
e. Automobile Bodily Injury and Property Damage Liability Insurance – with limits of at least $250,000.00 per person for Bodily Injury and at least $500,000.00 per accident for Bodily Injury and at least $100,000.00 per accident for Property Damage.

3. The above insurance policies shall also be subject to the following requirements:
   a. The Comprehensive Automobile Liability Insurance Policy shall be written to include Owned, Hired and Non-Owned Vehicles and it shall provide Extra Territorial Coverage.
   b. Contractor shall furnish to the Town (a) Certificate(s) of Insurance showing coverage as set forth above prior to performing any Work. All insurance coverages required herein shall be issued by companies licensed and authorized to do business in the Commonwealth of Massachusetts. The Town shall be named a Certificate Holder on all coverages set forth above with the additional requirement that the Town be named as an additional insured under the Comprehensive General Liability insurance coverage as required herein. The Town's status as an additional insured and/or certificate holder for each coverage shall be referenced on any and all Certificate(s) if Insurance issued to the Town. The Certificate Holder shall be the Town of Bedford, Town of Bedford Town Hall, 10Mudge Way, Bedford, MA 01730. Any and all Certificate(s) of Insurance shall be attached to and shall be incorporated by reference within the Agreement between parties.
   c. No Insurance coverage shall be subject to cancellation without at least fifteen (15) days prior written notice forwarded by registered or certified mail to both the Awarding Authority and the Designer. The Owner shall also be notified of the attachment of any restrictive amendments to the policies.
   d. All premium costs shall be included in the Contractor's bid.

03. CONTRACTOR'S CONTRACTUAL LIABILITY:

1. The Contractor hereby assumes the entire responsibility and liability for any and all injury to or death of any and all persons, including the Contractor's employees, servants, agents and representatives, and for any and all damage to property caused by, resulting from or arising out of any act, omission, or neglect on the part of the Contractor or of any Subcontractor or of anyone directly or indirectly employed by any one of them, or of anyone for whose acts any one of them may be liable in connection with operations under the Contract.

2. The Contractor further agrees to indemnify, defend (with counsel approved by the indemnified party) and hold harmless the Awarding Authority and the Designer, including the agents, servants, volunteers, officials, employees and representatives of either, from and against all claims, damages, debts, rights, actions, causes of action, costs, losses and expenses, including attorney's fees, arising out of or resulting from the performance of the Work, provided that any such claim, damage, debt, right, action, cause of action, cost, loss or expense is:
   a. attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and
   b. is caused in whole or in part by any willful negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any one of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

3 The intent of the Specifications regarding insurance is to specify minimum coverage and minimum limits of liability acceptable under the Contract. However, it shall be the Contractor's responsibility to purchase and maintain insurance of such character and in such amounts as will adequately protect him, the Awarding Authority and the Designer from and against all claims, damages, debts, rights, actions, causes of action, costs, losses and expenses resulting from exposure to any casualty liability in the performance of the Work.

04. DOCUMENTS INTENT, EXECUTION AND CORRELATION:

1. The entire work provided for in the technical Specifications and on the Drawings shall be performed and finished in every respect in a good workmanlike and substantial manner. All parts necessary for the proper and complete execution of the Work whether the same may have been specifically mentioned or not, or indicated in a manner corresponding with the rest of the Work shall be provided as if the same were particularly described and specifically provided for herein. It is not intended that the Drawings and Specifications shall show and describe every detailed piece of material or equipment, but such parts and pieces as may be in accordance with the best practices and regulatory requirements, even though not shown, shall be furnished and installed. All materials and equipment shall be new, unless specifically stated otherwise in these Contract Documents.

2. The Contract Documents, enumerated in the Contract Agreement, shall be signed in six (6) counterparts by the Awarding Authority and the Contractor.

3. What is called for by any one (1) of the Contract Documents shall be as binding as if called for by all as they shall be considered complementary and not standing alone. The intention of the documents is to include all labor and materials, equipment and transportation necessary for the proper execution of the Work. Materials or Work is described in words which when so applied have a well known technical or trade meaning and shall be held to refer to such recognized standards.

4. A contractual relationship of any kind shall not be created by the Contract Documents
   a. between the Designer and the General Contractor,
   b. between the Awarding Authority and a Subcontractor or Sub-subcontractor, or
   c. between any person or entities other than the Awarding Authority and the General Contractor.

   The Designer shall be entitled to perform and enforce the obligations under the Contract intended to expedite the Designer's performance of his duties.

5. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

Highest Priority:	Modifications, such as Change Orders, Construction Change Directives, and minor changes in the Work ordered by the Designer in accordance with the General Conditions.
Second Priority:	Agreement/Contract
Third Priority	Addenda - later date to take precedence
Fourth Priority	Bidding Requirements
Fifth Priority	Supplementary Conditions
Sixth Priority	General Conditions
Seventh Priority	Drawings and Specifications. Should the Drawings or the Specification disagree in themselves or with each other, the Contractor shall provide better quality or greater quantity of Work as determined by the Designer.

6. In the case of an inconsistency between Drawings and Specifications or within either document not clarified by Addendum, the better quality or greater quantity of Work shall be provided in accordance with the Designer's interpretation.

7. It is not intended that Work not covered under any heading, section, branch, class or trade of the Specifications shall be supplied unless it is shown on Drawings or is reasonably suggested from them as being obligatory to accomplish the design solutions.

05. DRAWINGS & SPECIFICATIONS COPIES:

1. The Contractor shall be furnished with three (3) sets of Drawings and Specifications and any additional sets required will be furnished at the cost of reproduction, to be paid by the Contractor.

06. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS:

1. The Designer shall furnish with reasonable promptness, additional instructions by means of Drawings or otherwise, necessary for the proper execution of the Work. All such Drawings and instructions shall be consistent with the Contract Documents, true developments thereof, and reasonably inferable therefrom.

2. The Work shall be executed in conformity therewith and the Contractor shall do no Work without proper Drawings and instructions.

07. DRAWINGS AND SPECIFICATIONS ON THE WORK:

The Contractor shall keep one (1) copy of all Drawings and Specifications on the Work, in good order, available to the Designer, Awarding Authority and to their representatives.

08. OWNERSHIP OF DRAWINGS - PROPERTY OF DESIGNER:

All Drawings, Specifications and copies thereof furnished by the Designer are his property. They are not to be used on other Work and, with the exception of the signed Contract sets, are to be returned to the Owner on request 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 the Designer's statutory, common law, copyright, and/or other reserved rights.

C. CONSTRUCTION

01. WORK EXECUTION REQUIREMENTS:

1. Unless otherwise provided in the Contract Documents, the Contractor shall provide, install, connect and pay for all materials, labor, equipment, water, tools, construction equipment, machinery, heat, utilities, transportation and other facilities necessary for the proper execution of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated into the Work.

2. Unless otherwise specified, all materials shall be new and both workmanship and materials shall be of good quality and to the satisfaction of the Designer and the Awarding Authority. The Contractor shall furnish satisfactory evidence as to the kind and quality of materials.

3. The Contractor shall at all times enforce strict discipline and good order among his employees, and shall not employ on the Work any unfit person or anyone not skilled in the Work assigned to him.

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

02. NOTIFICATION TO START CONSTRUCTION:

At least twenty-four (24) hours' notice of start of work under a building permit shall be given to the building official and to the Designer. Refer to Article 114.10 of the State Building Code.

03. HOURS OF WORK:

1. No laborer, workman or mechanic working on this project in the employ of the Contractor, or other persons doing or contracting to do the whole or a part of the Work contemplated by the Contract shall be requested to work more than eight (8) hours in any one (1) calendar day, nor more than forty-eight (48) hours in any one week, nor more than six (6) days in any one week, except in cases provided for by the applicable laws.
2. Work hours are between 7am to 2:30pm Local Time.
3. Work will not be permitted on Sundays. Work on Saturdays and or Holidays needs advance notification and approval from the Owner and the Bedford Police Department.

04. EMPLOYEES' RIGHT TO LODGE, BOARD, TRADE, ETC.

Every employee in the Work covered by this Contract shall lodge, board and trade where and with whom he elects and neither the Contractor nor his agents or employees shall directly or indirectly require as a condition of employment hereunder that the employees shall lodge, board or trade at a particular place or with a particular person.

05. ROYALTIES AND PATENTS - CONTRACTOR'S RESPONSIBILITY:

The Contractor shall pay all royalties and license fees. He shall defend with counsel acceptable to the Awarding Authority all suits or claims for infringement of any patent rights and shall save the Awarding Authority harmless from the loss on account thereof, and the Contractor shall be responsible for all such loss when a particular process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has information that the process or article specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information in writing to the Designer or the Awarding Authority.

06. SURVEYS, PERMITS AND REGULATIONS:

1. The Awarding Authority shall furnish all existing surveys unless otherwise specified.

2. Permits and licenses necessary for the prosecution of the Work shall be secured and paid for by the Contractor. Fees charged for permits issued by the Town of Bedford will be waived. Easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Awarding Authority.

3. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor observes that the Drawings and Specifications are at variance therewith, he shall promptly notify the Designer in writing and any necessary changes shall be adjusted as provided in the Contract for changes in the Work. If the Contractor performs any Work knowing or if the Contractor should have known it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Designer, he shall assume full responsibility and bear all costs arising therefrom.

4. The laws of the Federal Government, the Commonwealth of Massachusetts and the municipality in which the project is located shall govern the construction under this Contract.

5. KNOWLEDGE OF AND COMPLIANCE WITH LAWS, ETC.: The Contractor shall keep himself fully informed of all existing and future State and Federal Laws and Municipal By-laws, Ordinances, Rules and Regulations and of all orders and decrees of any bodies or tribunals having jurisdiction in any manner affecting those engaged or employed in the Work, of the materials used in the Work or in any way affecting the conduct of the Work. If any discrepancy or inconsistency is discovered in the Drawings, Specifications or Contract for this Work to be in violation of any such law, by-law, ordinance, rule, regulation, order or decree, the Contractor shall forthwith report the same in writing to the Designer. The Awarding Authority shall not be liable in the event that the Contractor fails to so report such discrepancy or inconsistency, in the event that the Contractor has actual or constructive knowledge of the same. The Contractor shall, at all times, himself observe and comply with and shall cause all his agents, representatives, employees and Subcontractors to observe and comply with all such existing and future laws, by-laws, ordinances, rules, regulations, orders and decrees; and shall protect and indemnify the municipality, and its Awarding Authority and agents against any claim or liability arising from or based on any violation whether by him or his agents, employees or Subcontractors of any such law, by-law, ordinance, rule, regulation, order or decree.

07. PROTECTION:

1. The Contractor shall continuously maintain and be responsible for adequate protection of all his Work from damage and shall protect the Awarding Authority's property from injury or loss arising in connection with the Contract. The Contractor shall assume liability for and shall be responsible for the repair and/or replacement of any such damage, injury or loss, except such as may be directly due to errors in the Contract Documents reported by the Contractor or caused by agents or employees of the Awarding Authority, or due to causes beyond the Contractor's control and not to his fault or negligence. The Contractor shall adequately protect adjacent property as provided by law and the Contract Documents.

2. The Contractor shall be solely responsible to take all necessary precautions for the safety of employees on the Work, and shall comply with all applicable provisions of Federal, State, and Municipal safety laws

and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the Work is being performed. The Contractor shall erect and properly maintain at all times, as required by the conditions and progress of the Work, all necessary safeguards for the protection of the public, and workmen, and shall post danger signs warning against the hazards created by such features of construction, including but not limited to, pits, protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways and falling materials; and he shall designate a responsible member of his organization on the Work, whose duty shall be the prevention of accidents. The name and position of the person so designated shall be reported to the Designer by the Contractor in writing prior to commencing work and shall not be changed without prior notice to the Designer about the name and position of the replacement designee.

3. The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss, including fire or theft to all of the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors as well as other property at the site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

4. In the event of temporary suspension of Work, or during inclement weather, or whenever the Designer shall direct, the Contractor shall protect, and shall cause the Contractor's Subcontractors to carefully protect, the Contractor's and Subcontractors' Work and materials against damage or injury from the weather. If, in the opinion of the Designer, any Work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors so to protect the Work, such materials shall be removed and replaced at the expense of the Contractor.

5. In an emergency affecting the safety of life or of the Work or of adjoining property, the Contractor, without special instruction or authorization from the Designer or the Awarding Authority, is hereby permitted to act at his discretion, to prevent such threatened loss or injury; and he shall so act, without appeal, if so authorized or instructed. Any compensation claimed by the Contractor on account of emergency Work, shall be determined by agreement or by a court of competent jurisdiction or arbitration.

6. The Contractor shall not be required to perform, without consent, any Work relating to or in the locale containing unprotected asbestos or polychlorinated biphenyl. In the event that this is in an unknown or unforeseen location, the Contractor shall stop Work immediately and report, in writing, the condition to the Designer and Owner. Work shall not be resumed except by written agreement of the Owner and Contractor.

08. CUTTING, PATCHING AND CLEAN-UP:

1. This Article establishes general requirements pertaining to cutting (including excavating), fitting, and patching of the Work required to:
   a. Make the several parts fit properly;
   b. Uncover work to provide for installing, inspecting, or both, of ill-timed work.
   c. Remove and replace work not conforming to requirements of the Contract Documents; and
   d. Remove and replace defective work.

   The Contractor shall be responsible for coordinating all cutting and patching for both filed and non-filed Subcontractors and his own forces. It is the intent of the Contract Documents to complete in every detail all new Work associated with this Contract.

2. Related work: In addition to other requirements specified, upon the Designer's request, the Contractor shall uncover work to provide for inspection by the Designer of covered work, and remove samples of installed materials for testing. Do not cut or alter work performed under separate contracts without the Designer's written permission.

3. Submittals - The Contractor shall, prior to cutting which effects structural safety, submit written request to the Designer for permission to proceed with cutting. Should conditions of the Work, or schedule, indicate a required change of materials or methods for cutting and patching, the Contractor shall so notify

the Designer and secure his written permission and the required Change Order prior to proceeding. Submit written notice to the Designer designating the time the Work will be uncovered, to provide for the Designer's observation.

4. For replacement of items removed, the Contractor shall use materials complying with pertinent Sections of the Specifications. The Contractor shall perform cutting and patching needed to comply with the Contract Documents at no additional cost to the Owner.

5. The Contractor shall inspect existing conditions, including elements subject to movement or damage during cutting, excavating, patching, and backfilling. After uncovering the work, conditions affecting installation of new work shall be inspected. If uncovered conditions are not as anticipated, the Contractor shall immediately notify the Designer and secure needed directions. Do not proceed until unsatisfactory conditions are corrected.

6. The Contractor shall provide required protection including, but not necessarily limited to, shoring, bracing, and support to maintain structural integrity of the Work.

7. Required excavating and backfilling shall be performed by the Contractor as required under pertinent other Sections of the Specifications. Perform cutting and demolition using methods that will prevent damage to other portions of the Work and provide proper surfaces to receive installation of repair and new work. Perform fitting and adjusting of products to provide finished installation complying with the specified tolerances and finishes.

8. Any cost caused by defective or ill-timed Work shall be borne by the party responsible therefore. Any damage to surrounding surfaces shall be restored at no cost to the Owner.

9. The Contractor shall not endanger any Work by cutting, excavating or otherwise altering the Work and shall not cut or alter the Work of any other Contractor except with the written consent of the Designer and the Awarding Authority.

10. The Contractor shall at all times keep the premises free from accumulation of waste materials, dust or rubbish caused by his employees or Work, and at the completion of the Work he shall remove all his rubbish from and about the building and all his tools, scaffolding and surplus materials and shall leave his Work "broom clean", and the premises landscaped or its equivalent, unless more exactly specified. In case of dispute the Awarding Authority may remove the rubbish and charge the cost to the several Contractors as the Designer shall determine to be just.

09. ACCESS TO WORK AND TESTING:

1. The Awarding Authority and its representatives shall have access to the construction areas to observe the Work at such times so as not to impede the progress of the Work or increase any risk to the Contractor.

2. If the Specifications, the Designer's instructions, laws, ordinances, rules, regulations, or any public authority require Work to be specifically tested or approved, the Contractor shall give the Designer and the Awarding Authority timely notice of its readiness for observation by the Designer or inspection by another authority, and if the inspection is by another authority, of the date fixed for such inspection, with required certificates of inspection being secured and provided by the Contractor. Observations by the Designer shall be promptly made, and where practicable, at the source of supply. If any Work should be covered up without approval or consent of the Designer, it must, if required by the Designer, be uncovered for examination at the Contractor's expense.

3. Re-examination of questioned Work may be ordered by the Designer or the Awarding Authority and if so ordered, the work must be uncovered by the Contractor. If such Work is found to be in accordance with the Contract Documents, the Awarding Authority shall pay the reasonable cost of re-examination and replacement. If such Work is found not to be in accordance with the Contract Documents, the Contractor shall pay such costs, unless it is found that the defect in the Work was caused by a Contractor employed under a separate contract as provided under paragraph C.12. below, and in that event, the Awarding Authority shall pay such cost.

10. SUPERINTENDENCE AND SUPERVISION BY CONTRACTOR:

1. The Contractor shall keep on his Work, during its progress, a competent superintendent and any necessary assistants, all satisfactory to the Designer and Owner. The superintendent shall not be changed except with the consent of the Designer and Owner, unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in his employ. The superintendent shall represent the Contractor in his absence and all directions given to him shall be as binding as if given to the Contractor. Important directions shall be confirmed in writing to the Contractor. Other directions shall be so confirmed on written request in each case. The Designer shall not be responsible for the acts or omissions of the superintendent or his assistants.

2. The Contractor shall give efficient supervision to the Work, using his best skill and attention. He shall carefully study and compare all Drawings, Specifications and other instructions and shall at once report, in writing, to the Designer and the Awarding Authority any error, inconsistency or omission which he may discover but he shall not be liable to the Awarding Authority for any damage resulting from errors or deficiencies in the Contract Documents or other instructions by the Designer unless the Contractor discovered, or should have discovered such error, inconsistency or omission and failed to notify the Designer as set forth herein.

3. The Contractor shall include supervision of Work performed by all Subcontractors on the Work. In addition, a qualified supervisor satisfactory to the Designer shall remain on duty during regular working hours until all the Work under this Contract is fully completed, including all items appearing on the list of incomplete and/or corrective Work issued at the time of final inspection. To accomplish this, the Contractor shall be required to maintain separate telephone service until all of the Work is satisfactorily completed. The Contractor shall identify the qualified supervisor and shall notify in advance the Owner and Designer of any change to the qualified supervisor. At the request of the Owner, the Contractor shall replace said supervisor with a suitably qualified supervisor at the request of the Owner.

4. The Contractor shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract and shall use best efforts not to interfere with the activities of the surrounding area, except as may be directed elsewhere in this Specifications.

5. The Contractor shall be responsible to the Awarding Authority for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing or supplying any of the Work.

6. The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Designer in his administration of the Contract, or by inspections, tests or approvals required or performed by persons other than the Contractor pursuant to the Contract Documents.

11. ASSIGNMENT OR SUB-LETTING AS A WHOLE:

Neither party to the Contract shall assign the Contract or sub-let it as a whole without the prior written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Awarding Authority.

12. SEPARATE CONTRACTS:

1. The Awarding Authority reserves the right to let other Contracts in connection with this Work under similar General Conditions. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate his Work with theirs.

2. To insure the proper execution of his subsequent Work, the Contractor shall measure Work already in place and shall at once report to the Designer, in writing, any discrepancy between the executed Work and the Drawings.

General Conditions

13. CONTRACTORS' MUTUAL RESPONSIBILITY:

1. Should the Contractor cause damage to any separate Contractor on the Work, the Contractor agrees, upon due notice, to settle with such Contractor by agreement or arbitration, if such Contractor will so settle. If such separate Contractor sues the Awarding Authority on account of any damage alleged to have been so sustained, the Awarding Authority shall notify the Contractor who shall indemnify, defend and hold harmless the Awarding Authority such proceedings, at the Contractor's expense, with counsel acceptable to the Awarding Authority and, if any judgment against the Awarding Authority arises therefrom, the Contractor shall pay or satisfy it and pay all costs incurred by the Awarding Authority, including reasonable attorney's fees.

2. The Contractor shall afford the Awarding Authority and separate Contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their Work, and shall connect and coordinate his Work with theirs as required by the Contract Documents.

3. If any part of the Contractor's Work depends for proper execution or results upon the Work of the Awarding Authority or any separate Contractor, the Contractor shall, prior to proceeding with the Work, inspect and promptly report to the Designer, in writing, any apparent discrepancies or defects in such other Work that render it unsuitable for such proper execution and results. Failure of the Contractor so to inspect and report shall constitute an acceptance of the Awarding Authority's or separate Contractor's Work as fit and proper to receive his Work, except as to defects which may subsequently develop and become apparent in such Work by others after the execution of the Work.

4. Should the Contractor wrongfully cause damage to the Work or property of the Awarding Authority, or to other Work on the site, the Contractor shall properly remedy such damage as provided herein.

14. SUBCONTRACTS:

1. All Subcontracts shall be awarded in conformity with the requirements of the Contract Documents and state statutes.

2. The Designer shall, on request, furnish to any Subcontractor, wherever practicable, evidence of the amounts certified on his account.

3. The Contractor agrees that he is as fully responsible to the Awarding Authority for the acts and omissions of his Subcontractors and of persons either directly or indirectly employed or retained by them, as he is for the acts and omissions of persons directly or indirectly employed by him.

15. CONTRACTOR/SUBCONTRACTOR RELATIONS:

1. The Contractor agrees to bind every Subcontractor and every Subcontractor agrees to be bound by the terms of the Contract Documents as far as applicable to his Work.

2. The Subcontractor agrees -
   a. To be bound to the Contractor by the terms of the Contract Documents, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Awarding Authority.
   b. To submit to the Contractor applications for payment in such reasonable time as to enable the Contractor to apply for payment under Paragraph F of the General Conditions.
   c. To make all claims for extras, for extensions of time, and for damages for delays or otherwise, to the Contractor in the manner provided in the Contract Documents for like claims by the Contractor upon the Awarding Authority, except that the time for making claims for extra cost is one (1) week.

3. The Contractor agrees -
   a. To be bound to the Subcontractor by all obligations that the Awarding Authority assumes to the Contractor under the Contract Documents, and by all the provisions thereof affording remedies and redress to the Contractor from the Awarding Authority.
   b. To be bound to Article 5 of the Contract Form.
   c. To pay the Subcontractor to such extent as may be provided by the Contract Documents or the Subcontract, if either of these provides for earlier or larger payments than the above.

d. That if the Designer fails to issue a Certificate for Payment for any cause which is the fault of the Contractor and not the fault of a particular Subcontractor, the Contractor shall pay that Subcontractor on demand, made at any time after the Certificate for Payment should otherwise have been issued, for his Work to the extent completed and for materials suitably stored, less the retained percentage.

e. To pay the Subcontractor a just share of any fire insurance money received by the Contractor, all as stipulated in the General Conditions.

f. To make no demand for liquidated damages or penalty for delay in any sum in excess of the amount as specifically named in the Supplementary Conditions.

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

h. To give the Subcontractor an opportunity to be present and to submit evidence in any litigation or arbitration involving his rights.

16. SITE VISITATION BY THE DESIGNER:

1. The Designer shall be the Awarding Authority's representative during the construction period. The Designer will make periodic visits to the site, at least weekly, to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. The Designer will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work and he will not be responsible for the Contractor's failure to carry out the construction Work in accordance with the Contract Documents. During such visits and on the basis of his observations while at the site, he will promptly keep the Awarding Authority informed of the progress of the Work, will endeavor to guard the Awarding Authority against defects and deficiencies in the Work of Contractors, and he may condemn or determine Work as failing to conform to the Contract Documents. The Designer shall have authority to act on behalf of the Awarding Authority only to the extent expressly provided in the Contract Documents or otherwise in writing, which shall be shown to the Contractor. The Designer shall have authority to stop Work whenever such stoppage may be necessary in his reasonable opinion to insure the proper execution of the Contract.

2. In connection with the Work, the Designer shall not be responsible for construction methods, means, techniques, sequences or procedures employed by the Contractor nor his safety programs, requirements, regulations or precautions.

3. The Designer shall be, in the first instance, the interpreter of the conditions of the Contract and the impartial judge of the performance thereunder by the Contractor or Owner.

4. In case of the termination of the employment of the Designer, the Awarding Authority shall appoint a capable and reputable Designer against whom the Contractor makes no reasonable objection, whose status under the Contract shall be that of the former Designer; any dispute in connection with such appointment shall be subject to arbitration.

17. DECISIONS OF THE DESIGNER:

1. The Designer shall, within a reasonable time, make all decisions on all claims of the Awarding Authority or Contractor and on all other matters relating to the execution and progress of the Work or the interpretation of the Contract Documents, but in no event later than fifteen (15) days after the Designer's receipt of any written request for interpretations from the Awarding Authority or Contractor.

2. In accordance with State Statutes, and excepting the time period specified in paragraph C.17.1. above, any decision or interpretation by the Awarding Authority, any official, or the Designer concerning the specifications, approval of equipment, material or other approval, or progress of the Work, shall be made promptly, and in any event, no later than twenty-one (21) days after the written submission for decision; but if such decision requires extended investigation and study, the Awarding Authority, the official, or the Designer shall, within twenty-one (21) days after the receipt of the submission, give the party making this submission written notice why the decision cannot be made within the twenty-one (21) day period and the date by which the decision will be made.

3. The Designer's decision, in matters relating to artistic effect, shall be final, if within the terms of the Contract Documents.

4. Except as to matters of artistic effect or as otherwise provided in the Contract Documents, all decisions by the Designer, or his failure to render a decision within a reasonable time, shall be subject to arbitration.

5. If, however, the Designer fails to render a decision within ten (10) days after the parties have presented their evidence, the parties may jointly agree to arbitration. If the Designer renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but shall not disturb or interrupt such proceedings except where such decision is acceptable to the parties concerned.

18. ARBITRATION:

1. All disputes, claims or questions subject to litigation under the Contract may be submitted to arbitration within six (6) months if the parties mutually agree in accordance with the provisions then prevailing of the Standard Form of Arbitration Procedure of the American Arbitration Association, and in such instance, the Agreement shall be specifically enforceable under the prevailing arbitration law, and judgment upon the award rendered may be entered in the court of forum, state or federal, having jurisdiction. Absent such mutual agreement, either party may submit any dispute, claim or question arising hereunder to a court of competent jurisdiction over Middlesex County, Massachusetts.
2. The Contractor shall not cause a delay of the Work during any arbitration or litigation proceedings, except by agreement with the Awarding Authority.

19. USE OF PREMISES BY CONTRACTOR:

1. The Contractor shall confine his apparatus, the storage of materials and the operations of his Workmen to limits indicated by law, ordinances, permits or directions of the Designer and shall not unreasonably encumber the premises with his materials.

2. The Contractor expressly undertakes at the Contractor's own expense to repair any damage to the Awarding Authority's property and facilities in the Work area and the access routes thereto.

3. The Contractor shall not load or permit any part of the structure to be loaded with a weight that will endanger its safety.

20. OSHA TRAINING:

In accordance with M.G.L. c. 30, § 39S, the Contractor must certify 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 ten (10) hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

21. CRIMINAL OFFENDER RECORDS INFORMATION (C.O.R.I):

In accordance with M.G.L. Ch. 71 Section 38R, the School Superintendent or School Principal may require criminal offender record information (CORI) from the criminal history systems board, relating to any worker who is scheduled to work in the School within areas of the School occupied by students. The Contractor and/or Subcontractors shall cooperate fully.

D. SUBMITTALS

01. SHOP DRAWINGS:

1. Shop Drawings shall be accurately drawn to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the Work. Shop Drawings shall be submitted in the form of three (3) blueline or blackline prints of each sheet. The Contractor shall review comments of the Designer shown on the drawing when it is returned to the Contractor. The Contractor may make and distribute

such copies as are required for his purposes. The Contractor shall submit all shop or setting Drawings and Schedules with such promptness as to cause no delay and conditions in his own Work or in that of any other Contractor, checked, stamped, and approved by him required for the Work of the various trades. These submittals shall represent that the Contractor has determined and verified materials, field measurements and field construction criteria required for the Work. The Designer shall check and approve, with reasonable promptness, such Schedules and Drawings only for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor shall make any corrections required by the Designer, file with him two (2) corrected copies, and furnish such other copies as may be needed.

2. The Designer's approval of such Drawings or Schedules shall not relieve the Contractor of deviations from the Contract Documents unless he has in writing called the Designer's attention to such deviations at the time of submission and secured his written approval, nor shall it relieve him from the responsibility for errors or omissions in Shop Drawings or Schedules. No fabrication and/or delivery of materials shall take place without approved Shop Drawings or submittals. The Designer's review shall not constitute approval of Contractor's safety precautions, nor approval of a specific item connote the approval of a complete assembly.

02. SAMPLES:

The Contractor shall furnish for approval, with such promptness as to cause no delay in his own Work or in that of any other Contractor, all Samples required by Sections of the Specifications and/or as directed by the Designer. The Designer shall check and approve such samples, with reasonable promptness, only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The Work shall be in accordance with approved samples. The Contractor shall provide Sample or Samples identical to the precise article proposed to be provided. Unless otherwise specified, the Contractor shall submit Samples in the quantity which is required by the separate Sections of this Specifications, one of which will be retained by the Designer. By prearrangement in specific cases, a single Sample may be submitted for review and, when approved, be installed in the Work at a location agreed upon by the Designer. In general, three (3) of each will be required.

03. SCHEDULES - PROGRESS, CONSTRUCTION, VALUES:

1. Immediately after being awarded the Contract, the Contractor shall prepare an estimated Construction Schedule and submit it for the Designer's approval. It shall indicate the dates for the starting and completion of the various stages of construction. It shall be revised as required by the conditions of the work at appropriate intervals.

2. To assure adequate planning and execution of the Work so that the Work is completed within the number of calendar days allowed in the Contract, and to assist the Designer in appraising the reasonableness of the proposed schedule and in evaluating progress of the Work, prepare and maintain progress schedules and reports.

3. Prior to start of construction, the Designer's approval of the Schedule of Values required to be submitted under subparagraph 1. above, and further described below in subparagraph 4., shall be secured. During progress of the Work, the Schedule of Values as approved by the Designer shall be modified to reflect changes in the Contract Sum due to Change Orders or other modifications of the Contract. Requests for payment shall be based on the approved Schedule of Values.

4. Schedule of Values - This Contractor shall submit a typed schedule on AIA Form G703 - Application and Certificate for Payment and Continuation Sheets in duplicate within fifteen (15) days after date of Owner-Contractor Agreement utilizing the Table of Contents of this Project Manual. Each line item shall be identified with number and title of the major specification Section and value shall include a directly proportional amount of Contractor's overhead and profit within each line item, including quantities if requested, aggregating the total sum of the Contract, divided so as to facilitate payments to Subcontractors, and, if required, supported by such evidence as to its correctness as the Designer may direct. This Schedule, when approved by the Designer, shall be used as a basis for Certificates for Payment, unless it be found to be in error. In applying for payments, the Contractor shall submit a statement based upon this Schedule. Site mobilization, bonds and insurance shall be identified.

Contractor's standard form or electronic media printout will be considered. The Contract shall revise the Schedule to list approved Change Orders, with each Application for Payment.

04. SUBSTANTIAL COMPLETION:

1. Substantial completion shall not be deemed to have occurred until the Contractor completes the following items:
   a. Prepare and submit punch list as required by the Specifications.
   b. Apply for and obtain an occupancy certificate from the Building Official.

2. Within a reasonable time after receipt of the punch list, the Designer will inspect to determine status of completion.

3. Should the Designer determine that the Work is not substantially complete:
   a. The Designer will promptly so notify the Contractor in writing, giving the reasons therefore.
   b. The Contractor shall remedy the deficiencies and notify the Designer in writing, when ready for re-inspection.
   c. The Designer will subsequently re-inspect the Work.

4. When the Designer concurs that the Work is substantially complete:
   a. The Designer will prepare a "Certificate of Substantial Completion", accompanied by the Contractor's list of items to be completed or corrected, as verified by the Designer.
   b. The Designer will submit the Certificate to the Owner and to the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

05. FINAL COMPLETION:

1. The Contractor shall verify that the Work is complete including, but not necessarily limited to, the items mentioned in paragraph 06. below. Final Completion shall not be deemed to have occurred until the Contractor has prepared and submitted a notice to the Designer that the Work is ready for final inspection and acceptance.

2. The Contractor shall certify that:
   a. Contract Documents have been reviewed;
   b. Work has been inspected for compliance with the Contract Documents;
   c. Work has been completed in accordance with the Contract Documents;
   d. Equipment and systems have been tested as required, and are operational;
   e. Work is completed and ready for final inspection.
   f. Certification in writing to the Building Official per the applicable provisions of the State Building Code.

3. The Designer will make an inspection to verify status of completion.

4. Should the Designer determine that the Work is incomplete or defective:
   a. The Designer will promptly so notify the Contractor, in writing, listing the incomplete or defective work.
   b. The Contractor shall thereon remedy the deficiencies promptly, and notify the Designer when ready for re-inspection.

5. When the Designer determines that the Work is acceptable under the Contract Documents, and that all submittals required by paragraph 06 are in order and approved, he will certify this to the Owner and the Contractor.

06. CLOSEOUT SUBMITTALS:

Closeout submittals include, but are not necessarily limited to:

1. Project Record Documents described in the Specifications;
2. Operation and maintenance data for items so listed in pertinent other Sections of the Specifications, and for other items when so directed by the Designer;
3. Warranties and bonds;

4. Spare parts and materials extra stock;
5. Evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
   a) Certificates of Inspection;
   b) Certificates of Occupancy;
6. Certificates of Insurance for products and completed operations;
7. Evidence of payment and release of liens or release of obligations;
8. List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.

07. FINAL ADJUSTMENT OF ACCOUNTS:

1. The Contractor shall submit a final statement of accounting to the Designer, showing all adjustments to the Contract Sum.

2. If so required, the Designer will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

08. INSTRUCTION:

The Contractor shall instruct the Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work. The Contractor shall provide all applicable instruction manuals and other documentation for systems, equipment, and similar items.

09. WARRANTY:

1. General:

All equipment, materials and workmanship are guaranteed free from defects for a period of one (1) year. The warranty period shall commence upon final acceptance. If at any time during the period of one (1) year from the date of the final acceptance any part of such work shall in the reasonable opinion of the Owner’s Representative be defective or require replacing or repairing, or damage to other property of the Owner is caused by any defect in the Work, the Owner shall notify the Contractor in writing to make the required repairs or replacements and repair such damage. If the Contractor shall neglect to commence such repairs or replacements to the satisfaction to the Owner within ten (10) days from the date of the giving of such notice, then the Owner may employ other persons to make the same. The Contractor agrees, upon demand, to pay to the Owner all amounts which it expends for such repairs, replacements, and/or damages. During this one (1) year guarantee period any corrective work shall be performed under the applicable terms of this Contract. This one (1) year guarantee shall not limit any express or warranty provided elsewhere in the Contract and shall not limited any express warranty of any manufacturer or supplied providing materials or equipment for the Work.

2. One-Year Warranty Repair List and Inspection:

Approximately ninety (90) days prior to the expiration of the comprehensive one-year warranty period, the Contractor shall schedule an appointment with the Awarding Authority for a re-inspection of the Work with the Awarding Authority, and shall thereafter inspect the work at the time scheduled. Based on this inspection and on prior inspections, the Awarding Authority shall issue a "Warranty Repair List" of items to be corrected by the Contractor. The Contractor shall make the repairs and/or replacements listed within thirty (30) days of the issuance of the Warranty Repair List unless otherwise agreed by the Awarding Authority in writing.

3. Special Guarantees and Warrantees:

A. The Contractor’s obligation to correct Work as set forth in paragraph 1 above is in addition to, and not in substitution of, such guarantees or warranties as may be required in the various sections of the Specifications.
B. Guarantees and warranties required in the various sections of the Specifications must be delivered to the Owner before final payment to the Contractor may be made, or in the case of guarantees and warranties which originate with a subcontractor’s section of the Work, before final payment for the amount of that sub-trade or for the phase of Work to which the guarantee or warranty relates.

The failure to deliver a required guarantee or warranty shall constitute a failure to fully complete the Work in accordance with the Contract Documents.

E. EXCEPTIONS & MODIFICATIONS

01. CHANGES IN WORK:

1. The Awarding Authority, without invalidating the Contract, may order extra Work or make changes by altering, adding to or deducting from the Work, the Contract Sum being adjusted accordingly. All such Work shall be executed under the conditions of the original Contract except that any claim for extension of time caused thereby shall be adjusted, in writing, at the time of ordering such change. The Contractor may be required to document in writing how this charge affects the progress schedule and/or the final completion date. All requests for time extensions shall be evaluated as set forth in paragraph 04 Extension of Time and Delays listed below.

2. In giving instructions, the Designer shall have authority to make minor changes in the Work, not involving extra cost, and not inconsistent with the purposes of the project, but otherwise, except in an emergency endangering life or property, no extra Work or change shall be made unless in pursuance of a written order from the Awarding Authority.

3. The Designer shall prepare Change Orders and will have the authority to order minor changes in the Work as provided herein. A Change Order is a written order to the Contractor, signed by the Awarding Authority and the Designer, issued after the execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the time of completion. The Contract Sum and the time of completion may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or in the change in the time of completion.

4. Change Order Procedure - Include within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with the procedure for processing Change Orders. A "Register of Proposal Requests, Supplemental Instructions, Change Proposals, and Change Orders" shall be maintained by the Contractor at the job site, accurately reflecting current status of all pertinent data. The Contract shall make the Register available to the Designer for review at his request.

   Supplementary Instructions: From time to time during progress of the Work the Designer may issue Supplemental Instructions which interpret the Contract Documents or order minor changes in the Work without change in Contract Sum or Contract Time. Should the Contractor consider that a change in Contract Sum or Contract Time is required, he shall submit an itemized Change Proposal to the Designer immediately and before proceeding with the Work. If the Change Proposal is found to be satisfactory and in proper order, the Supplemental Instructions in that event will be superseded by a Change Order.

   Proposal Requests: From time to time during progress of the Work the Designer may issue a Proposal Request for an itemized quotation for changes in the Contract Sum and/or Contract Time incidental to proposed modifications to the Contract Documents. This will not be a Change Order, and will not be a direction to proceed with the changes described therein. The Contractor shall make a written reply to the Designer in response to each proposal request; state proposed change in the Contract Sum, if any; state proposed change in the Contract Time of Completion, if any; and clearly describe other changes in the Work, if any, required by the proposed change or desirable therewith. Full backup data such as Subcontractors' letter of proposal or similar information shall be included. The Contractor shall submit this response in single copy. When cost or credit for the change has been agreed upon by the Owner and the Contractor, or the Owner has directed that cost or credit be determined in accordance with provisions of the General Conditions, the Designer will issue a Change Order to the Contractor. Change Orders will be numbered in sequence, and dated. The Change Order will describe the change or changes, will refer to the Proposal Requests or Supplemental Instructions involved, and will be signed by the Owner and the Designer. The Designer will issue seven copies of each Change Order to the Contractor for his execution. The Contractor shall sign and return all copies to the Designer promptly for submittal to the Awarding Authority for its execution.

5. The value of any such extra Work or change shall be determined in one or more of the following ways:
   a. By estimate and acceptance in a lump sum which shall include not more than fifteen (15%) for overhead expense, supervision, cost of bond and profit. When lump sum estimates are submitted by a Subcontractor, the Contractor shall have the right to add 7.5% to such lump sums for his overhead expense, supervision, cost of bond and profit.
   b. By unit prices named in the Contract. For unit prices, the percentages for overhead expense, supervision, cost of bond and profit is included in the unit prices.

6. The Designer may require breakdown of costs, invoices or other materials as documentation.

02. EXTRA CLAIMS:

If the Contractor claims that any instructions by Drawings or otherwise involve extra cost under the Contract, he shall give the Designer and the Awarding Authority written notice of the specifics thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the Work, except in an emergency endangering life or property, and the procedure shall then be as provided for Changes in Work set forth in paragraph E.01. No such claim shall be valid unless so made.

03. UNCORRECTED WORK:

If the Designer and the Awarding Authority deem it inexpedient to correct Work injured or done not in accordance with the Contract, an equitable deduction from the Contract Sum shall be made therefore.

04. EXTENSION OF TIME AND DELAYS:

1. If the Contractor be delayed at any time in the progress of the Work by any act or neglect of the Awarding Authority or the Designer, or of any employees of either, or by any separate Contractor employed by the Awarding Authority, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, unavoidable casualties or any causes beyond the Contractor's control, or by delay authorized by the Designer pending arbitration, or by any cause which the Designer shall decide to justify the delay, then the time of completion shall be extended for such reasonable time as the Designer may decide.

2. No such extension shall be made for delay occurring more than seven (7) days before the claim therefore is made in writing to the Designer. In the case of a continuing cause of delay, only one claim is necessary.

3. If no schedule or agreement stating the dates upon which Drawings shall be furnished is made, then no claim for delay shall be allowed on account of failure to furnish Drawings until two (2) weeks after demand for such Drawings and not then unless such claim be reasonable.

4. Extension of time will not be allowed:
   a. due to inclement weather except in cases of locally declared disaster due to hurricane or flood;
   b. for extra Work where the specific item can be performed by the regular work force during two (2) regular working days or the value of such specific item does not exceed two thousand dollars ($2,000.00); or
   c. because of the Contractor's failure to place, submit and process orders for materials.

5. This paragraph E.04does not exclude the recovery of damages for delay by either party under other provisions in the Contract Documents.

05. CORRECTION OF WORK:

1. The Contractor shall promptly remove from the premises all Work condemned or determined by the Designer as failing to conform to the Contract, whether incorporated or not, and the Contractor shall promptly replace and re-execute his own Work in accordance with the Contract and without expense to the Awarding Authority and shall bear the expense of making good all Work of other Contractors destroyed or damaged by such removal or replacement.

2. If the Contractor does not remove such condemned or rejected Work within a reasonable time, fixed by written notice from the Designer, the Awarding Authority may remove it and may store the material at the expense of the Contractor. If the Contractor does not pay the expenses of such removal within ten (10) days' time thereafter, the Awarding Authority may, upon ten (10) days' written notice, sell such materials at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor. This remedy shall be in addition to all other remedies of the Awarding Authority under the Contract Documents and applicable laws arising as a result of Contractor's breach of this Contract.

3. The Contractor shall remedy any defects due to faulty materials or workmanship and pay for any damage to other Work resulting therefrom, which shall appear within a period of one (1) year from the date of Substantial Completion as defined in these General Conditions, and in accordance with the terms of any special guarantees provided in the Contract. The Awarding Authority shall give notice in writing of observed defects with reasonable promptness. All questions arising under this paragraph shall be decided by the Designer subject to the dispute resolution procedures, notwithstanding final payment.

4. The Contractor shall promptly, but in all events within sixty (60) days, correct all Work rejected or condemned by the Designer as defective or failing to conform to the Contract Documents, whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such condemned or rejected Work, including compensation for the Designer's additional services made necessary thereby, and any cost, loss or damage to the Awarding Authority resulting from such defect or failure. This obligation shall survive the termination of the Contract.

5. Nothing contained in this paragraph shall be construed to create a limitation period as regards other obligations of this Contract, or an Owner's remedy for proceedings to commence to establish the Contractor's Liability, other than the correction of Work.

06. PARTIAL USE OF BUILDING:

1. Should the Contractor be delayed in the progress of the work beyond the date of completion and should the Designer certify to the Awarding Authority that a portion of the building is ready for occupancy, the Awarding Authority reserves the right to occupy such portion of the building for general purposes and such occupancy shall not be construed as interfering with the provisions of the Contract, relating to the time of completion, occupancy and acceptance of the entire project.

2. For any variance between the above paragraph and the Laws, as amended, the latter shall govern.

07. RIGHT OF AWARDING AUTHORITY TO DO WORK:

If the Contractor should neglect to prosecute the Work properly or fail to perform any provision of the Contract, the Awarding Authority, after seven (7) days' written notice to the Contractor may, without prejudice to any other remedy he may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the Contractor, provided however, that the Designer shall approve both such action and the amount charged the Contractor. The remedy under this paragraph is not exclusive and shall be in addition to all other remedies available to the Awarding Authority.

08. RIGHT OF AWARDING AUTHORITY TO TERMINATE CONTRACT:

1. If a petition is filed by the Contractor, or against the Contractor with his consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such petition is filed against the Contractor without his consent and is not dismissed within sixty (60) days, or if the Contractor is generally not paying his debts as they become due, or if the Contractor becomes insolvent, or if the Contractor consents to the appointment of a receiver, trustee, liquidator, custodian or the like of the Contractor or of all or any substantial portion of its assets and such appointment or possession is not terminated within sixty (60) days, or if the Contractor makes an assignment for the benefit of creditors, or if the Contractor refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he fails to make prompt payment to a Subcontractor, or for materials or labor, or disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction or otherwise is guilty of or responsible for a substantial violation of any provision of the Contract Documents, then the Awarding Authority, without prejudice to any right or

remedy, and after giving the Contractor and his surety, if any, seven (7) days written notice, may terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished and any payment at such later date shall only be for services rendered in accordance with this Contract prior to termination.

2. In such case of termination of the Contract pursuant to paragraph E.08.1. above, the Awarding Authority may, at its election (but is under no obligation to), assume and become liable for the obligations, commitments, and unsettled claims the Contractor has previously undertaken and incurred in good faith in connection with said Work. Should the Awarding Authority so elect, the Contractor shall execute and deliver assignment of his contractual rights as the Awarding Authority may require, for the purpose of fully vesting in himself the rights and benefits of the Contractor under such obligations or commitments.

3. The Owner may terminate this Contract upon written notice to the Contractor if a source of money to fund the Contract is lost during this Contract term. In the alternative, the parties may agree in writing to amend the Contract to provide for a Contract price, which represents a reduced appropriation for the Contract term.

09. SUSPENSION, DELAY OR INTERRUPTION DUE TO ORDER OF AWARDING AUTHORITY:

1. The Awarding Authority may order the General Contractor in writing to terminate, suspend, delay, or interrupt all or any part of the Work for such a period of time as it may determine to be appropriate for the convenience of the Awarding Authority; provided however, that if there is a suspension, delay or interruption for fifteen (15) days or more or due to a failure of the Awarding Authority to act within the time specified in this Contract, the Awarding Authority shall make an adjustment in the Contract Sum for any increase in the cost of performance of this Contract but shall not include any profit to the General Contractor on such increase; and provided further, that the Awarding Authority shall not make any adjustment in the Contract Sum under this provision for any suspension, delay, interruption, or failure to act to the extent that such is due to any cause for which this Contract provides for an equitable adjustment of the Contract Sum under any other Contract provisions.

2. The General Contractor must submit the amount of a claim under paragraph V.1. above to the Awarding Authority in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this Contract and, except for costs due to a suspension order, the Awarding Authority shall not approve any costs in the claim incurred more than twenty (20) days before the General Contractor notified the Awarding Authority in writing of the act or failure to act involved in the claim.

F. PAYMENTS

01. PROGRESS PAYMENTS AND PAYMENTS TO SUBCONTRACTORS:

1. Progress payments shall be made pursuant to Articles 4 and 5 of the Contract Form and paragraph D.03 of the General Conditions.
2. The Contractor shall, before the first application, submit to the Designer a Schedule of Values of the various parts of the Work as per paragraph D.03 of the General Conditions.
3. Applications for Payment - On or about the tenth (10th) day of each month, the General Contractor shall submit a monthly requisition covering work up to the first (1st) of the month to the Awarding Authority through the Designer. Payments will be made in accordance with the Contract requirements, including governing laws. The Contract Sum and the schedule for payments are described in the Form of Agreement. A formal submittal of request for payment shall be made by filling in the pertinent data, by typewriter or neat lettering in ink, on AIA Document G702, "Application and Certificate for Payment," plus continuation sheet or sheets which shall be signed and notarized. The original plus six (6) identical copies of the Application and Certificate for Payment, and the continuation sheet or sheets, shall be submitted to the Designer for his submittal to the Awarding Authority for its execution. The Designer's approval of Applications for Payments upon Substantial Completion and Final Completion of the Work are described in the General Conditions paragraph D Submittals, subparagraphs: 04 Substantial Completion, 05 Final Completion, 06 Closeout Submittal, 07 Final Adjustment of Accounts, 08

Instruction, 09 Warranty, and will be contingent upon the Designer's approval of status of Project Record Documents and Punch List items.

4. The Contractor shall make payments on account to his Subcontractors as provided under the contract form.

02. CERTIFICATES BY THE DESIGNER:

1. If the Contractor has made application for payment as per the Contract Documents, the Designer shall, not later than the date when each payment falls due, issue a Certificate for Payment to the Contractor for such amount as the Designer has decided to be properly due and submit same to the Awarding Authority for its execution, or state in writing his reasons for withholding a certificate.
2. No certificate issued nor payment made to the Contractor, nor partial or entire use or occupancy of the Work by the Awarding Authority, shall be an acceptance of any Work or materials not in accordance with the Contract. When advised by the Contractor that the Work is substantially completed, the Designer and the Contractor shall, within a reasonable time, make a joint inspection of the Work. If the Designer shall determine that the Work is substantially completed, he shall then prepare a Certificate of Substantial Completion, which shall be submitted to the Awarding Authority and the Contractor for their execution. The making and acceptance of the final payment shall constitute a waiver of all claims by the Awarding Authority, other than those arising from unsettled liens, from faulty Work appearing after Substantial Completion or from failure to comply with Drawings and Specifications and the terms of any warrantees and special guarantees specified in the Contract and of all claims by the Contractor, except those previously made and still unsettled. Certification shall be in strict compliance with the statutory requirements.
3. Such applications for payment shall not include requests for items in dispute for which the Contractor does not intend paying a Subcontractor or supplier.
4. Payment may be made, if approved in advance by the Awarding Authority, for equipment and/or materials stored off site. This is conditional upon title transfer and insurance naming the Owner, and that all storage and transportation costs will be carried by the Contractor.
5. Title shall pass to the Owner for all work covered by the Application for Payment no later than the date of payment.

03. WITHHOLDING OF PAYMENTS:

The Designer may withhold or, on account of subsequently discovered evidence, nullify the whole or a part of any certificate to such extent as may be necessary, in his reasonable opinion, to protect the Awarding Authority from loss on account of:

a. Defective Work not remedied;
b. Claims filed or reasonable evidence indicating probable filing of claims;
c. Failure of the Contractor to make payments properly to Subcontractors or for material or labor;
d. A reasonable doubt that the Contract can be completed for the balance then unpaid, or within the Contract Time;
e. Damage to another Contractor or Owner;
f. Failure to carry out the Work in accordance with the Contract Documents.

Withholding of payments shall be in strict compliance with statutory requirements. When the above grounds are removed, payment shall be made for amounts withheld because of them.

04. DAMAGES:

Should either party to the Contract suffer damages because of any wrongful act or neglect or omission of the other party or of anyone employed by him, claim shall be made in writing to the party liable within a reasonable time of the first observance of such damage and not later than the final payment, except as expressly stipulated otherwise in the case of faulty Work or materials, and shall be adjusted by agreement or the dispute resolution provisions set forth herein.

05. DAMAGES FOR DELAY:

The Contractor SHALL PAY the Awarding Authority all expenses, losses and damages as determined by the Designer, incurred in consequence of any defect, omission or mistake of the Contractor or his employees, agents or representatives, and shall also pay for each and every calendar day that he shall be in default in completing the work at each site as agreed upon in the Contract, the sum stipulated in the Supplementary Conditions, which sum is hereby agreed upon not as a penalty but as liquidated damages which the Awarding

Authority will suffer daily by reason of such default. PROVIDED - that the Awarding Authority may, it its own election, accept the Work, if there has been such a degree of completion as will, in the Awarding Authority's opinion, make the entire project reasonably safe, fit and convenient for the use and accommodation for which it was intended. In such case, the Contractor shall not be charged with liquidated damages, but the Awarding Authority may assess the actual damages caused by such delay. Partial acceptance shall not modify the condition of default.

06. LIENS OR RELEASE OF OBLIGATION:

1. Neither the final payment nor any part of the retained percentage shall become due until the Contractor, if required, shall deliver to the Awarding Authority either a complete release of all liens arising out of the Contract, or receipts that as far as he has knowledge or information, the releases and receipts include all the labor and materials for which a lien could be filed.

2. Where liens are precluded on public works projects, a release of obligation shall be required. The Contractor may utilize AIA Documents G706 or G706A for this purpose from Subcontractors and/or suppliers.

3. The Contractor shall comply with all statutory provisions.

07. TIME ALLOWANCE TO COMPLETE WORK

The commencement work date shall be fixed in the “Notice to Proceed”, issued by the Owner. On site work shall not commence before June 24, 2016. The Awarding Authority requires substantial completion of the work no later than August 1, 2017, as shown on the Drawings and stated in the “Notice to Proceed”. If the Contractor fails to complete the work on that date, he shall pay the Awarding Authority, as liquidated damages, the sum of Two Hundred Dollars ($200.00) per day for each calendar day until the work is completed in accordance with the Contract Documents.

Beneficial occupancy shall be defined as "the Awarding Authority's ability to occupy the building for the use for which it was intended" and shall include all mechanical and electrical systems are operational for the comfort and safety of the occupants and all work complete to the satisfaction of all state and local agencies having jurisdiction.

END OF GENERAL CONDITIONS

Supplementary Conditions

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Supplementary Conditions Index

A. SUPPLEMENTAL EQUAL EMPLOYMENT OPPORTUNITY, ANTI-DISCRIMINATION AND AFFIRMATIVE MARKET PROGRAM:

Supplemental Equal Employment Opportunity, Anti-Discrimination and Affirmative Action Program", containing seven (7) pages, are enclosed in Attachment A.

B. MINIMUM WAGE RATES & HEALTH & WELFARE & PENSION FUND CONTRIBUTIONS:

1. Minimum wage rates and health and welfare and pension fund contributions as determined by the Commissioner under the provisions of the Massachusetts General Laws Chapter 149, §§ 26 to 27D, inclusive, as amended.
2. Copies of said determination are included herewith.
3. Excerpts from Sections 26 and 27 of Massachusetts General Laws Chapter 149 appear below:

Section 26:. . .Payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

Section 27:. . .The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans, pension plans and supplementary unemployment benefit plans as provided in said section twenty-six, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, a pension plan and a supplementary unemployment benefit plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction.

Supplementary Conditions Index

THE COMMONWEALTH OF MASSACHUSETTS

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

ATTACHMENT A

I. Definitions

For purposes of this contract,

"Minority" means a person who meets one or more of the following definitions:

(a) American Indian or Native American means: all persons having origins in any of the original peoples of North America and who are recognized as an Indian by a tribe or tribal organization.

(b) Asian means: All persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian sub-continent, or the Pacific Islands, including, but not limited to China, Japan, Korea, Samoa, India, and the Philippine Islands.

(c) Black means: All persons having origins in any of the Black racial groups of Africa, including, but not limited to, African-Americans, and all persons having origins in any of the original peoples of the Cape Verdean Islands.

(d) Eskimo or Aleut means: All persons having origins in any of the peoples of Northern Canada, Greenland, Alaska, and Eastern Siberia.

(e) Hispanic means: All persons having their origins in any of the Spanish-speaking peoples of Mexico, Puerto Rico, Cuba, Central or South America, or the Caribbean Islands.

"State construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility, or a contract for the construction, reconstruction, alteration, remodeling or repair of a public work undertaken by a department, agency, board, or commission of the commonwealth.

"State assisted construction contract" means a contract for the construction, reconstruction, installation, demolition, maintenance or repair of a building or capital facility undertaken by a political subdivision of the commonwealth, or two or more political subdivisions thereof, an authority, or other instrumentality and whose costs of the contract are paid for, reimbursed, grant funded, or otherwise supported, in whole or in part, by the commonwealth.

II. Equal Opportunity, Non-Discrimination and Affirmative Action

During the performance of this Contract, the Contractor and all subcontractors (hereinafter collectively referred to as "the Contractor") for a state construction contract or a state assisted construction contract, for him/herself, his/her assignees and successors in interest, agree to comply with all applicable equal employment opportunity, non-discrimination and affirmative action requirements, including but not limited to the following:

In connection with the performance of work under this contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability, shall not discriminate in the selection or retention of subcontractors, and shall not discriminate in the procurement of materials and rentals of equipment.

The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising, layoff or termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship or on-the-job

training opportunity. The Contractor shall comply with the provisions of chapter 151B of the Massachusetts General Laws, as amended, and all other applicable anti-discrimination and equal opportunity laws, all of which are herein incorporated by reference and made a part of this Contract.

The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Massachusetts Commission Against Discrimination setting forth the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B).

In connection with the performance of work under this contract, the Contractor shall undertake, in good faith, affirmative action measures to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. Such affirmative action measures shall entail positive and aggressive measures to ensure non-discrimination and to promote equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, apprenticeship and on-the-job training programs. A list of positive and aggressive measures shall include, but not be limited to, advertising employment opportunities in minority and other community news media; notifying minority, women and other community-based organizations of employment opportunities; validating all job specifications, selection requirements, and tests; maintaining a file of names and addresses of each worker referred to the Contractor and what action was taken concerning such worker; and notifying the administering agency in writing when a union with whom the Contractor has a collective bargaining agreement has failed to refer a minority or woman worker. These and other affirmative action measures shall include all actions required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, sex, sexual orientation, genetic information, military service, age, ancestry or disability. One purpose of this provision is to ensure to the fullest extent possible an adequate supply of skilled tradesmen for this and future Commonwealth public construction projects.

III. Minority and Women Workforce Participation

Pursuant to his/her obligations under the preceding section, the Contractor shall strive to achieve on this project the labor participation goals contained herein. Said participation goals shall apply in each job category on this project including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers and those classes of work enumerated in Section 44F of Chapter 149 of the Massachusetts General Laws. The participation goals for this project shall be 15.3% for minorities and 6.9% for women. The participation goals, as set forth herein, shall not be construed as quotas or set-asides; rather, such participation goals will be used to measure the progress of the Commonwealth's equal opportunity, non-discrimination and affirmative action program. Additionally, the participation goals contained herein should not be seen or treated as a floor or as a ceiling for the employment of particular individuals or group of individuals.

IV. Liaison Committee

At the discretion of the agency that administers the contract for the construction project there may be established for the life of the contract a body to be known as the Liaison Committee. The Liaison Committee shall be composed of one representative each from the agency or agencies administering the contract for the construction project, hereinafter called the administering agency, a representative from the Office of Affirmative action, and such other representatives as may be designated by the administering agency.

The Contractor (or his/her agent, if any, designated by him/her as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.

V. Reports and Records

The Contractor shall prepare projected workforce tables on a quarterly basis when required by the administering agency. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also, when updated, to the administering agency and the Liaison Committee when required.

The Contractor shall prepare weekly reports in a form approved by the administering agency, unless information required is required to be reported electronically by the administering agency, the number of hours worked in each trade by each employee, identified as woman, minority, or non-minority. Copies of these shall be provided at the end of each such week to the administering agency and the Liaison Committee.

Records of employment referral orders, prepared by the Contractor, shall be made available to the administering agency on request.

The Contractor will provide all information and reports required by the administering agency on instructions issued by the administering agency and will permit access to its facilities and any books, records, accounts and other sources of information which may be determined by the administering agency to effect the employment of personnel. This provision shall apply only to information pertinent to the Commonwealth's supplementary non-discrimination, equal opportunity and access and opportunity contract requirements. Where information required is in the exclusive possession of another who fails or refuses to furnish this information, the Contractor shall so certify to the administering agency and shall set forth what efforts he has made to obtain the information.

VI. Access to Work Site

A designee of the administering agency and a designee of the Liaison Committee shall each have a right to access the work site.

VII. Solicitations for Subcontracts, and for the Procurement of Materials and Equipment

In all solicitations either by competitive bidding or negotiation made by the Contractor either for work to be performed under a subcontract or for the procurement of materials or equipment, each potential subcontractor or supplier shall be notified in writing by the Contractor of the Contractor's obligations under this contract relative to non-discrimination and equal opportunity.

VIII. Sanctions

Whenever the administering agency believes the General or Prime Contractor or any subcontractor may not be operating in compliance with the provisions of the Fair Employment Practices Law of the Commonwealth (Massachusetts General Laws Chapter 151B), the administering agency may refer the matter to the Massachusetts Commission Against Discrimination ("Commission") for investigation.

Following the referral of a matter by the administering agency to the Massachusetts Commission Against Discrimination, and while the matter is pending before the MCAD, the administering agency may withhold payments from contractors and subcontractors when it has documentation that the contractor or subcontractor has violated the Fair Employment Practices Law with respect to its activities on the Project, or if the administering agency determines that the contractor has materially failed to comply with its obligations and the requirements of this Section. The amount withheld shall not exceed a withhold of payment to the General or Prime Contractor of 1/100 or 1% of the contract award price or $5,000, whichever sum is greater, or, if a subcontractor is in non-compliance, a withhold by the administering agency from the General Contractor, to be assessed by the General Contractor as a charge against the subcontractor, of 1/100 or 1% of the subcontractor price, or $1,000 whichever sum is greater, for each violation of the applicable law or contract requirements. The total withheld from any one General or Prime Contractor or subcontractor on a Project shall not exceed $20,000 overall. No withhold of payments or

investigation by the Commission or its agent shall be initiated without the administering agency providing prior notice to the Contractor.

If, after investigation, the Massachusetts Commission Against Discrimination finds that a General or Prime Contractor or subcontractor, in commission of a state construction contract or state-assisted construction contract, violated the provisions of the Fair Employment Practices Law, the administering agency may convert the amount withheld as set forth above into a permanent sanction, as a permanent deduct from payments to the General or Prime Contractor or subcontractor, which sanction will be in addition to any such sanctions, fines or penalties imposed by the Massachusetts Commission Against Discrimination:

No sanction enumerated under this Section shall be imposed by the administering agency except after notice to the General or Prime Contractor or subcontractor and an adjudicatory proceeding, as that term is used, under Massachusetts General Laws Chapter 30A, has been conducted.

IX. Severability

The provisions of this section are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

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X. Contractor's Certification

A bidder for a state construction contract or state assisted construction contract will not be eligible for award of the contract unless such bidder has submitted to the administering agency the following certification, which will be incorporated into the resulting contract:

CONTRACTOR'S CERTIFICATION

_____certifies that they:
(Contractor Name)

1. Will not discriminate in their employment practices;

2. Intend to use the following listed construction trades in the work under the contract

   _____

   _____; and

3. Will make good faith efforts to comply with the minority employee and women employee workforce participation ratio goals and specific affirmative action steps contained herein; and

4. Are in compliance with all applicable federal and state laws, rules, and regulations governing fair labor and employment practices; and

5. Will provide the provisions of the "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" to each and every subcontractor employed on the Project and will incorporate the terms of this Section into all subcontracts and work orders entered into on the Project.

6. Agree to comply with all provisions contained herein.

_____
(Signature of authorized representative of Contractor) Date

_____
(Printed name of authorized representative of Contractor)

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XI. Subcontractor Requirements

Prior to the award of any subcontract for a state construction contract or a state assisted construction contract, regardless of tier, the Prime or General Contractor shall provide all prospective subcontractors with a complete copy of this Section entitled "Supplemental Equal Employment Opportunity, Non-Discrimination and Affirmative Action Program" and will incorporate the provisions of this Section by reference into any and all contracts or work orders for all subcontractors providing work on the Project. In order to ensure that the said subcontractor's certification becomes a part of all subcontracts under the prime contract, the Prime or General Contractor shall certify in writing to the administering agency that it has complied with the requirements as set forth in the preceding paragraph.

ATTACHMENT C

MUNICIPAL CONTRACTS
STATE ASSISTED BUILDING PROJECTS
MODEL CONTRACT INSTRUCTIONS

APPENDIX to General Conditions of the Contract

GOALS FOR PARTICIPATION BY MINORITY BUSINESS ENTERPRISES (MBE) AND WOMEN BUSINESS ENTERPRISES (WBE) (EXECUTIVE ORDER 390, M.G.L. c. 7, s. 4)

Design Participation: Combined MBE/WBE goal of (17.9%)
Construction Participation: Combined MBE/WBE goal of (10.4%)

The combined goals require a reasonable representation of both MBE and WBE firm participation on the project as further set forth in Attachment C, Section A, Paragraph 2.

1. <u>Goals</u>
The goals for minority business enterprise (MBE) and woman business enterprise (WBE) participation established for this Contract are as set forth above and in the Owner - Contractor Agreement.

2. <u>MBE/WBE Participation Credit</u>

A. If the Contractor is itself an MBE or a WBE, MBE/WBE participation credit shall be given in an amount equal to the entire Contract Price. If the Contractor is not an MBE or WBE, then MBE/WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

B. If the Contractor is a joint venture with one or more MBE/WBE joint ventures, MBE/WBE participation credit shall be given to the joint venture as follows:

(1) If the joint venture is certified by SDO as an MBE or WBE, MBE/WBE Participation credit shall be given in an amount equal to the entire Contract Price.

(2) If the joint venture is not certified as an MBE or WBE by SDO, MBE/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the MBE/WBE joint venture(s), and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.

C. If an MBE/WBE supplies, but does not install equipment or materials, MBE/WBE participation credit shall be given only if the MBE/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. MBE/WBE participation credit shall be given the full amount of the purchase order only if the MBE/WBE supplier manufactures the goods or substantially alters them before resale. Otherwise, a contractor may count toward its MBE/WBE goal 60 percent of the total bid price for its expenditures of its materials and supplies required under a contract and obtained from a MBE/WBE regular supplier.

D. MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may

not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.

3. Establishing MBE/WBE Status.

A. A minority owned business shall be considered as an MBE only if it has been certified as a minority business enterprise by the Supplier Diversity Office ("SDO").

B. A woman owned business shall be considered as a WBE only if it has been certified as a woman business enterprise by SDO.

C. Certification as a disadvantaged business enterprise ("DBE"), certification as MBE/WBE by any agency other than SDO, or submission of an application to SDO for certification as an MBE/WBE shall not confer MBE/WBE status on a firm for the purposes of this Contract.

4. Subcontracts with MBE/WBEs

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

5. Performance of Contract Work by MBE/WBEs

A. The Contractor shall not perform with its own organization or subcontract or assign to any other firm work designated to be performed by any MBE/WBE in the Letters of Intent or Schedule of MBE/WBE Participation without the prior Approval of the Awarding Authority, nor shall any MBE/WBE assign or subcontract to any other firm, or permit any other firm to perform any of its MBE/WBE Work without the prior Approval of the Awarding Authority. Any such unapproved assignment, subcontracting, sub-subcontracting, or performances of MBE/WBE Work by others shall be a change in the MBE/WBE Work for the purposes of this Contract. **THE AWARDING AUTHORITY WILL NOT APPLY TO THE MBE/WBE PARTICIPATION GOAL(S) ANY SUMS ATTRIBUTABLE TO SUCH UNAPPROVED ASSIGNMENTS, SUB-CONTRACTS, SUB-SUBCONTRACTS, OR PERFORMANCE OF MBE/WBE WORK BY OTHERS.**

B. The Contractor shall be responsible for monitoring the performance of MBE/WBE Work to ensure that each scheduled MBE/WBE performs its own MBE/WBE Work with its own workforce.

C. The Contractor and each MBE/WBE shall provide the Awarding Authority with all information and documentation that the Awarding Authority determines is necessary to ascertain whether or not an MBE/WBE has performed its own MBE/WBE Work. At the discretion of the Awarding Authority, failure to submit such documentation to the Awarding Authority shall establish conclusively for the purpose of giving MBE/WBE participation credit under this Contract that such MBE/WBE did not perform such work.

D. With each progress payment request submitted by the Contractor to the Awarding Authority, the Contractor must provide the Contractor Progress Payment Report indicating the value of payments for each MBE and WBE firms for that period.

6. Notification of Changes in MBE/WBE Work

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

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

7. Actions required if there is a Reduction in MBE/WBE Participation

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

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

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

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

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

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

(6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the MBE/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from MBE/WBEs, and/or sending written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to MBE/WBEs.

B. If the Contractor is unable to meet the MBE/WBE participation goals for this Contract after complying fully with each of the requirements of paragraph "A" above, and the Contractor is otherwise in full compliance with the terms of this Article, the Awarding Authority may reduce the MBE/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

8. <u>Suspension of Payment and/or Performance for Noncompliance.</u>

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

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

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

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

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

9. Liquidated Damages; Termination

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

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

(2) The Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between:

(a) The total of the MBE/WBE participation goals set forth in this Contract, and;

(b) The amount of MBE/WBE participation credit earned by the Contractor for MBE/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the MBE/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the Awarding Authority represents the parties' best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

B. Before exercising its rights and remedies hereunder, the Awarding Authority may give the Contractor and any other interested party another opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SOMWBA to participate in any proceedings undertaken hereunder.

10. Reporting Requirements

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

11. Awarding Authority's Right to Waive Provisions of this Article in Whole or In Part

The Awarding Authority reserves the right to waive any provision or requirement of this Article if the Awarding Authority determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by the Executive Director of the Supplier Diversity Office (SDO). No other action or inaction by the Awarding Authority shall be construed as a waiver of any provision of this Article.

EXHIBIT A
SCHEDULE FOR PARTICIPATION BY MINORITY/WOMEN BUSINESS ENTERPRISES

Project Number_____
Project Location_____
Project Name _____

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

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

Company Name & Address	MBE or WBE	Describe MBE/WBE Scopes of Work (clarify "Labor Only", "Material Only" or "Labor and Material")	If Supplier, Indicate Total Value of Supplies (60% of Total Counts toward Participation)	Total Dollar Value of Participation
1.				
2.				
3.				
4.				
5.				

MBE Goal: $_____ **Total Dollar Value of MBE Commitment: $**_____ _____**%**

WBE Goal: $_____ **Total Dollar Value of WBE Commitment: $**_____ _____**%**

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

Name of Firm_____

Business Address_____

Print Name_____

Authorized Signature _____

Title_____

Telephone No._____ **Fax No.**_____

Date _____

EXHIBIT B

LETTER OF INTENT
MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION

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

Project Number_____
Project Name _____
Project Location _____
To _____
Name of General Bidder/Sub-bidder

Indicate SDO Certification:
_____ MBE
_____WBE
_____MBE/WBE

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

M/WBE PARTICIPATION

Section/Item Number (If Applicable)	Describe MBE/WBE Scopes of Work (Clarify "Labor Only", "Material Only" or "Labor and Material")	If Supplier, Indicate Total Value of Supplies (60% of Total Counts Toward Participation)	Dollar Value of Participation

Total Dollar Value: $_____ _____%

Name of M/WBE Firm_____

Business Address_____

Print Name_____

Authorized Signature _____

Title_____

Telephone No._____ Fax No._____

Date _____

EXHIBIT C
CONTRACTOR PROGRESS PAYMENT REPORT
MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION

Project Number: _____

Project Name: _____

Project Location: _____

Date: _____

Periodical Payment No.: _____

General Contractor: _____

MBE and/or WBE: _____

One copy of this report is to be submitted for each Minority Business Enterprise (MBE) and/or Women Business Enterprise (WBE) at the time of submitting a request for payment. Copies of the report must be sent to the Minority Business Enterprise (MBE) and/or Women Business Enterprise (WBE) named above and to the municipalities Affirmative Marketing Construction Officer (AMCO). The AMCO will forward a copy of each Contractor Progress Payment Report to SDO on a quarterly basis.

1. The total price to be paid to the above-named Minority Business Enterprise _____ and/or Women Business Enterprise _____: $_____

2. The amount remitted to the Minority Business Enterprise and/or Women Business Enterprise as of the above date for work performed under this project: $_____

3. Balance due the Minority Business Enterprise and/or Women Business Enterprise as of the above date for work performed under the above-named project: $_____

4. Comments or explanation of amounts indicated under items 1 and 2 above: _____

_____

_____

_____

5. We hereby certify that the information supplied herein (including pages attached) is correct and complete.

General Contractor:	**Minority and/or Women Business Enterprise**
_____	_____
(Signed)	**(Signed)**
_____	_____
(Title)	**(Title)**
_____	_____
(Date)	**(Date)**

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SECTION 01 03 00
ALTERNATES

1. SCOPE

A. This Section lists the Alternates which appear in the Contract Documents. Consult the individual sections of the detailed requirements of each Alternate.

B. Bid prices for each Alternate shall include overhead, profit, and all other expenses incidental to the Work under each Alternate.

C. The Contractor and its subcontractors shall be responsible for examining the scope of each Alternate generally defined herein and for recognizing modifications to the Work caused by the Alternates and including the cost thereof in the bid price.

2. ALTERNATE NO. 1 ADD ALTERNATE

A. This alternate includes all work associated with the renovation and reconfiguration of the main office, nurse's office and teacher's areas as indicated on the drawings. The work includes but is not limited to partitions; doors and frames; skylights; floor, wall and ceiling finishes; interior specialties and casework; mechanical; electrical; plumbing; and fire protection work to create fully functional spaces.
   1. The addition of a single exterior door as indicated on the drawings is part of the base bid scope of work.

B. See following drawings for scope of add alternate:
   1. A-0.0 Cover Sheet for drawing list and matrix; A-0.1 Site Phasing and Work Zone Plan
   2. All sheets in table below:

A-0.0	COVER SHEET & DRAWING MATRIX
A-0.1	SITE PHASING & WORK ZONE PLAN
D-1.1	DEMOLITION PLANS AT RENOVATION AREAS
D-1.3	DEMOLITION REFLECTED CEILING PLANS AT RENOVATION
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P-0.1 PLUMBING LEGEND, NOTES & SCHEDULES
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E-1.1 FIRST FLOOR LIGHTING PLAN
E-1.3 FIRST FLOOR ELECTRICAL PLAN
E-1.5 FIRST FLOOR LOW TENSION PLAN
E-3.0 POWER RISER & POWER ONE LINE DIAGRAM
E-3.1 LEGEND & SCHEDULES
FA-1.1 FIRST FLOOR FIRE ALARM PLAN

C. Refer to the following specification sections:
1. Division 01 Contract Requirements
2. Section 01 10 00 – Summary Of The Work
3. Sections – all except 05 12 00, 05 21 00, 05 51 13, 07 42 13, 31 10 00, 31 25 00, 32 13 13, 32 16 40, 32 90 00, 32 90 05, 32 90 12, 33 40 00.

3. ALTERNATE NO. 2 ADD ALTERNATE

A. All work associated with expanded parking lot above the base parking lot expansion as indicated on the drawings.
A. See following drawings for scope of add alternate:
1. A-0.0 Cover Sheet for drawing list and matrix; A-0.1 Site Phasing and Work Zone Plan
2. All sheets in table below:

A-0.0 COVER SHEET & DRAWING MATRIX
A-0.1 SITE PHASING & WORK ZONE PLAN
EX-1.1 LIMITED EXISTING CONDITIONS PLAN, SHEET 1
EX-1.2 LIMITED EXISTING CONDITIONS PLAN, SHEET 2
C1.1 PROPOSED SITE PREPARATION PLAN
C1.2 PROPOSED SITE PREPARATION PLAN
C4.1 PROPOSED SITE PREPARATION PLAN ALT. 2
C5.1 PROPOSED GRADING AND SOIL EROSION CONTROL PLAN ALT. 2

C6.1 PROPOSED LAYOUT AND STORM DRAINAGE PLAN ALT. 2

C7.1 CIVIL DETAILS

L1.2 PROPOSED LANDSCAPE IMPROVEMENTS PLAN ALT. NO. 2

SE-1 SITE LIGHTING PLAN

B. Refer to the following specification sections:

1. Division 01 Contract Requirements
2. Section 01 10 00 – Summary Of The Work
3. Sections – 26 00 00, 31 10 00, 31 25 00, 32 13 13, 32 16 40, 32 90 00, 32 90 05, 32 90 12, 33 40 00

END OF SECTION

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SECTION 01 10 00
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The following:
1. This paragraph
2. Contract Description
3. Construction Schedule
4. Add Alternates
5. Work under this Contract
6. Filed Sub-Bids
7. Work Sequence
8. Contractor Use of Premises
9. Work to be Preformed by Owner
10. Emergency Procedures
11. Field Engineering
12. Reference Standards
13. Pre-Construction Conference
14. Project Meetings
15. Permits, Inspection, and Testing Required by Governing Authorities
16. Safety, Health and Environmental Regulations
17. Protection and Repair of New & Existing Facilities, Surfaces, and Utilities
18. Contract Documents
19. Definitions

1.2 CONTRACT DESCRIPTION

A. Contract
1. Type: Stipulated Sum.
2. This contract will be let by the Town of Bedford

Representation:

Owner: Town of Bedford

Owner's Representative:
Taissir Alani, Director of Facilities
Bedford Public Facilities Department
101 McMahon Rd., rear
Bedford, MA 01730
(781) 275-5290
(781) 275-1212 After Hours Emergency

Architect:
Robert Jefferies, Principal
TBA Architects, Inc.
43 Bradford Street, Concord, MA 01742
Telephone (781) 893-5828

1.3 CONSTRUCTION SCHEDULE

A. Start and Completion Date:

1. Coordinate with owner. All contract work and finish work shall be complete and site cleared on or before August 23, 2017. Start date for onsite work is anticipated for June 22, 2016.

1.4 ADD ALTERNATES –

A. As included in section 01 03 00 Alternates.

1.5 WORK UNDER THIS CONTRACT

A. The work of this contract includes all labor, material, and equipment necessary to perform the work at the Additions and Renovations to Lt. Job Lane Elementary Schoolas indicated on the contract documents and as specified herein. The general scope of the work is defined as follows:

B. Project Scope of Work:

** This scope of work is provided to the General Contractor as a convenience, it is not intended to limit the scope of work outlined in the Construction Documents.

** All work is related to:

1. West Wing multi-storey addition:
2. Cafeteria Expansion:
3. Alteration to existing Computer Lab to create two new language classrooms.
4. Alteration of existing communicating stair to widen and separate half flights including smoke separation of lower floor from main floor.
5. Alteration of existing Library Space to eliminate ramp and small office and replace ramp with new wheelchair lift and the creation of a new AV room.
6. Re-opening room at existing west wing second floor (language classrooms) by releasing and closing existing movable partition.
7. Addition of a single exterior door in the main office as part of the base bid.
8. Expansion of the east parking lot as part of the base bid.
9. Regrading, extension of drainage systems and finish landscaping associated with the West Wing addition and the cafeteria expansion.
10. All additions, alterations and modifications to the LT Job Lane Elementary School shall result in fully functional and finished spaces.
11. Mechanical, electrical, plumbing, fire protection and fire alarm systems are to be extended from existing systems. Mechanical systems include new Energy Recover Ventilators in addition to extension of existing systems.
12. Add Alternate #1: Alterations and reconfiguration of the main office area.
13. Add Alternate #2: Further expansion of the east parking lot and relocation of the existing playground.

C. Examination of the site and Contract documents:

1. Each General Bidder shall visit the site of the proposed work and shall fully acquaint himself with the conditions as they exist so that he may fully understand and evaluate the facilities, difficulties and restrictions attending the execution of the work under this Contract.
2. A pre-bid conference, to answer any questions and to view the project site, will be held on May 25, 2016 @ 3:00 pm at the Lt Job Lane Elementary School
3. No questions from Bidders will be accepted within 4 days excluding Saturday and Sunday of the Bid opening.
4. Bidders shall thoroughly examine and be familiar with the Drawings and Specifications. Each General Bidder shall include in his bid any work required in connection with the same that has to be done by trades under his direct control.
5. Plans, surveys, measurements, calculations, estimates, and statements as to the conditions under which the work is to be performed are believed to be correct. Each bidder must satisfy himself by his own investigation and research to conditions affecting the work to be done and labor and material needed and make his bid in reliance thereon.
6. Before ordering any material or doing any work, all measurements shall be verified by the General Contractor at the site. No extra charge or compensation will be allowed on account of the difference between actual dimensions and the measurements indicated on the Drawings. Any difference which may be found shall be submitted to the Designer for consideration before proceeding with the work.
7. The failure or omission of any bidder to receive or examine any form, instrument or document, or to visit the site and acquaint himself with the conditions there existing, shall in no way relieve any bidder from any obligation with respect to his bid.

D. Subcontractors shall carefully inspect all the listed drawings, not just those pertaining particularly to his sub-trade, and shall provide all work normally done by the sub-trade unless specifically called for otherwise, regardless of where among the drawings it appears.

1.6 FILED SUB-BIDS

Filed-Sub Bid for the following Trades:

(X) Masonry	( ) Ornamental Iron	( ) Waterproofing etc.	(X) Roofing & Flashing
(X) Glass & Glazing	( ) Lathing & Plaster	(X) Acoustical Ceilings	(X) Metal Windows
( ) Marble	(X) Tile	( ) Terrazzo	(X) Resilient Floors
(X) Painting	( ) Elevators	(X) Plumbing	(X) Fire Protection
(X) HVAC	(X) Electrical		

1.7 WORK SEQUENCE

A. The Contractor shall arrange all his work schedules within the hours of 7:00 a.m. to 6:00 p.m. during the regular work week. Work must be scheduled and performed in such a manner as to not interfere with the work of other Contractors.

B. Work requiring the presence of Bedford School personnel on nights, Sundays, or holidays will not be permitted except in case of emergency, or when approved in writing by the Bedford Project Manager. After hours work requiring the assistance of Bedford School personnel may result in back charges to the Contractor. Any work to be performed on Saturdays will require the prior approval of the Bedford Project Manager.

C. For the duration of the project the Bedford Project Manager, representing the Town of Bedford will be:

1. Taissir Alani, Director of Facilities
(781) 275-5290

1.8 CONTRACTOR USE OF PREMISES

A. Contract limits of construction shall be confined within actual work areas as shown on drawings.

B. Confine apparatus, storage of materials and construction operations to areas agreed to by the Bedford Project Manager and so not to interfere with the normal operating functions of the facility. Do not unreasonably encumber the premises with materials.

C. The Contractor and his employees are prohibited from entering, using or being in any buildings except for authorized business.

D. The Bedford School Department can neither accept nor assume responsibility for the security of the Contractor's material or equipment; which is lost, stolen or vandalized. The Contractor is advised to exert caution in placement and storage of his equipment and material.

E. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the normal day to day operations, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

F. Radios, CD players, or other audio entertainment equipment, including personal radio/CD players, shall not be allowed on the project site.

1.9 WORK TO BE PERFORMED BY OWNER

1. N.A.

1.10 EMERGENCY PROCEDURES

A. The Contractor shall thoroughly familiarize himself with Emergency Procedures and inform all subcontractors of same. These procedures will be explained at the pre-construction meeting.

B. Emergencies:

In the event of an emergency on-site, telephone for emergency services (ambulance, fire department or police assistance):

1. Telephone for emergency service.

2. Make the scene safe.

3. Render First-Aid if possible.

4. Preserve evidence.

6. Contact the appropriate outside agencies as required by law, including OSHA for multiple injuries (by Contractor), and DEP, NRC, etc.

1.11 FIELD ENGINEERING

A. Provide field engineering services, performed by a licensed survey; establish grades, lines and levels, by use of recognized engineering survey practices.

1.12 REFERENCE STANDARDS

A. For products specified by association or trade standard, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

1.13 PRE-CONSTRUCTION CONFERENCE

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

1.14 PROJECT MEETINGS

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

1.15 PERMITS, INSPECTION, AND TESTING REQUIRED BY GOVERNING AUTHORITIES

A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the work to be inspected, tested or approved, the General Contractor shall give the Designer and such Authority timely notice of its readiness so the Designer may observe such inspection and testing.

B. Prior to the start of construction, the General Contractor shall complete application to the Commonwealth of Massachusetts Building Inspector and pay the required fee for a Building Permit. The Plumbing Contractor shall pay the required fee and obtain a Plumbing Permit from the Town of Bedford Plumbing Inspector, and the Electrical Contractor shall pay the required fee and obtain an Electrical Permit from the Town of Bedford Electrical Inspector. The General

Contractor shall provide copies of all permits to the Project Manager and such Permits shall be displayed in a conspicuous location at the project site.

C. ALL personnel working on site shall be required to submit information for a CORI check. Information shall be provided two weeks in advance of person starting on site work. Persons wishing to work on site shall appear in person at the Department of Public Facilities with identification necessary for CORI checks. Contractor shall coordinate this with the Town's project manager.

1.16 SAFETY, HEALTH AND ENVIRONMENTAL REGULATIONS

A. In addition to Article III of the Contract and General Conditions, each General Contractor and subcontractor shall observe the following stipulations:

1. Perform all work in accordance with federal and with Massachusetts Department of Labor and Industries safety and health standards and guidelines and provide a healthful and safe work conditions. See Section 001300 Administrative Requirements for Indoor Air Quality requirements.
2. Maintain a written hazard communication program in accordance with OSHA 29CFR 1910.1200. Keep MATERIAL SAFETY DATA SHEETS (MSDS) on site and upon request provide MSDS sheets for materials used in the construction.
3. All Hot Works, including cutting, welding, brazing, etc., shall include the following equipment and procedures.
   a. Contractor must provide a minimum of an approved and operable 20 BC rated fire extinguisher near each LPG operation approved by a recognized testing laboratory.
   b. An approved and operable fire extinguisher must be kept in the work area.
   c. At least one (1) workman must remain at the work area for (1) hour after the use of the torch or flame-producing device has ceased.
4. All construction will comply strictly with the Massachusetts State Building Code - Article 30 (780 CMR 30): Required fencing, sidewalk sheds, storage of flammables, portable fire extinguishers, fire standpipe operation and rubbish removal will be enforced by Environmental Health & Safety.

1.17 PROTECTION & REPAIR OF NEW AND EXISTING FACILITIES, SURFACES, & UTILITIES

A. The Contractor shall be responsible for exercising necessary care to avoid damage to Bedford Public School property.

B. The Contractor shall secure the work area and equipment at the end of each workday and shall provide hardware and locks where required. The contractor shall provide locks compatible with the Bedford Public School hardware core system. The Town of Bedford will provide the Contractor with construction cores which shall be installed by the Contractor.

C. The repair, replacement, and/or restoration of any existing electrical, steam, drain, water or sewer lines, or other utility, interfered with by the Contractor, shall be completed in accordance with the State Specifications for each phase of

the work using experienced, competent labor, and new and unused materials meeting specifications and current codes.

D. The General Contractor shall take precaution in execution of work for demolition of existing structures and materials not to disturb or damage any existing structures, landscaping, walks, roads, etc. scheduled to remain. The Contractor shall restore any damaged items to original condition and as directed by the Designer or Project Manager.

E. Protect finished surfaces, including jambs and soffits of openings used as passageways, through which equipment and materials are handled.

F. Provide protection for finished floor surfaces in traffic areas prior to allowing equipment or materials to be moved over such surfaces.

G. In event of damage, promptly make replacements and repairs to the approval of the Project Designer and. Project Manager and at no additional cost to the Town of Bedford.

1.18 CONTRACT DOCUMENTS

A. A reasonable number of sets of contract plans and specifications will be furnished by the Town immediately after signing of the contract, one of which shall be maintained intact at the site for reference by authorized representatives of the Town of Bedford. If additional copies are required, the Contractor shall be responsible for obtaining additional copies and all associated costs.

1.19 DEFINITIONS

A. Words in the singular shall also mean and include the plural, wherever the context so indicates, and words in the plural shall mean the singular, wherever the context so indicates.

B. Wherever the terms "shown on drawings" are used in the specifications, they shall mean "noted", "indicated", "scheduled", "detailed", or shall refer to any other diagrammatic or written reference made on the drawings.

C. Wherever the term "provide" is used in the specifications or on the drawings it will mean "furnish" and "install", "connect", "apply", "erect", "construct", or similar terms, unless otherwise indicated in the contract documents.

D. Wherever the term "material" is used in the specifications it will mean any "product", "equipment", "device", "assembly", or "item" required under the Contract, as indicated by trade or brand name, manufacturer's name, standard specifications reference or to other description.

E. The terms "approved" or "approval" shall mean the written approval of the Designer or Project Manager.

F. The term "specifications" shall mean all information contained in the bound or unbound volume, including all "Contract Documents" defined herein, except for the drawings.

G. "Concealed" means hidden from sight in chases, furred spaces, shafts, hung ceilings, embedded in construction or in crawl spaces.

H. "Exposed" means not installed underground or "concealed" as defined above.

I. "Architect" shall refer to Architect and/or Project Manager.

J. "Designer" shall refer to the licensed professional designer of record for the project.

K. "Hazardous Waste" shall refer to a waste, or combination of wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause, or significantly contribute to an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health, safety, or welfare or to the environment when improperly treated, stored, transported, used or disposed of, or otherwise managed, however, not to include solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Water Pollution Control Act of 1967 as amended, or source, special nuclear, or by product material as defined by the Atomic Energy Act of 1954."

PART 2 - NOT USED

PART 3 - NOT USED

END OF SECTION 01 10 00

SECTION 01 20 00

PRICE AND PAYMENT PROCEDURES

1.1 GENERAL REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the drawings, and all other parts of the Contract Documents are hereby made a part of this section.

1.2 SECTION INCLUDES

A. Schedule of values.

B. Applications for payment.

C. Change procedures.

D. Defect assessment.

E. Unit Prices.

F. Alternates

1.3 SCHEDULE OF VALUES

A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702. Contractor's standard form or electronic media printout will be considered but must be approved by the Architect..

B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Identify site mobilization, bonds and insurance.

D. Include in each line item, amount of Allowances specified in this section.

E. Include within each line item, direct proportional amount of Contractor's overhead and profit.

F. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application on AIA Form G702 - Application and Certificate for payment and AIA G703 - Continuation Sheet for G702.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Submit updated construction schedule with each Application for Payment.

D. Payment Period: Applications will be submitted monthly for review and approval by Architect. Payment period after approval: 20 days.

E. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Include the following with Application for Payment:

1. Construction progress schedules, revised and current.

1.5 CHANGE PROCEDURES

A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.

B. The Architect/Engineer will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.

C. The Architect/Engineer may issue a Proposal Request Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit estimate within 5 days.

D. Contractor may propose changes by submitting a request for change to Architect/Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with Section 01600.

E. Construction Change Directive : Architect/Engineer may issue directive, on AIA Form G713 Construction Change Directive signed by Owner, instructing

Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

F. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in Conditions of the Contract. In Time and Material Change Orders, the Contractor will be allowed a 15% markup for General Contractor work and 5% markup for Subcontractor work. Architect/Engineer will determine change allowable in Contract Sum/Price and Contract Time as provided in Contract Documents.

G. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

H. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.

I. Change Order Forms: AIA G701.

J. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in Conditions of the Contract.

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Architect/Engineer it is not practical to remove and replace the Work, the Architect/Engineer will direct appropriate remedy or adjust payment.

C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Owner.

D. Defective Work will be partially repaired to instructions of Architect/Engineer and unit sum/price will be adjusted to new sum/price at discretion of Owner.

E. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

F. Authority of Architect/Engineer to assess defects is final.

G. The Authority of the Owner to identify payment adjustments is final.

H. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.
7. Work.

1.7 UNIT PRICES: Not used

1.8 ALTERNATES:

A. Add Alternate #1: Main Office Alteration and Reconfiguration,

B. Add Alternate #2 Expansion of the east parking lot (above the base bid expansion) and relocation of playground

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Section.

1.2 SECTION INCLUDES

A. Coordination and project conditions.

B. Preconstruction meeting.

C. Progress meetings.

D. Cutting and patching.

E. Special procedures.

1.3 COORDINATION AND PROJECT CONDITIONS

A. This project is to be performed on an occupied building. Contractor will take every effort to minimize the impact of the work on the building occupants and coordinate its operations with the Owner. Contractor will inform the Owner two days before any work that will impact egress or access to the building.

B. The project will generate dust and air pollutants which will affect Indoor Air Quality IAQ. The contractor shall make all efforts to maintain safe Air Quality within all areas of the school during the construction period. (See Indoor Air Quality Program methods attached at the end of this section.)

C. The Owner will be providing certain work during the contract period including but not limited to upgrades and extensions to the IT networks and relocation of

computer labs and equipment. Contractor will coordinate its efforts with the Owner towards this end.

D. Coordinate scheduling, submittals, and Work of various sections of Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

E. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, operating equipment.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

H. Coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 PRECONSTRUCTION MEETING

A. Owner will schedule meeting after Notice of Award.

B. Attendance Required: Owner, Architect/Engineer, Contractor.

C. Agenda:

1. Execution of Owner-Contractor Agreement.

2. Submission of executed bonds and insurance certificates.

3. Distribution of Contract Documents.

4. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.

5. Designation of personnel representing parties in Contract, Filed Sub-Contractors, and Architect/Engineer.

6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.

7. Protection of existing work and paving.

8. Scheduling.

1.5 PROGRESS MEETINGS

A. Contractor will be available for meetings throughout progress of the Work at maximum bi-monthly intervals.

B. Attendance Required: Job superintendent, Owner, Architect/Engineer, as appropriate to agenda topics for each meeting.

C. Agenda:

1. Review minutes of previous meetings.

2. Review of Work progress.

3. Field observations, problems, and decisions.

4. Identification of problems impeding planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine existing conditions prior to commencing work.

3.2 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.

B. Execute cutting, fitting, and patching including excavation and fill, to complete Work, and to:

1. Fit the several parts together, to integrate with other Work.

2. Uncover Work to install or correct ill-timed Work.

3. Remove and replace defective and non-conforming Work.

4. Remove samples of installed Work for testing.

5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.

C. Execute work by methods to avoid damage to other Work, and to provide proper surfaces to receive patching and finishing.

D. Cut masonry and concrete materials using masonry saw or core drill.

E. Restore Work with new products in accordance with requirements of Contract Documents.

F. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.

H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

I. Identify hazardous substances or conditions exposed during the Work to Architect/Engineer for decision or remedy.

3.3 SPECIAL PROCEDURES

A. Protection of newly paved and striped parking area. Contractor is responsible to protect the existing parking area and will be required to return the lot in the present condition.

B. Materials: As specified in product sections; match existing with new products for patching and extending work.

C. Employ skilled and experienced installer to perform alteration work.

D. Cut, move, or remove items as necessary for access to alterations and renovation Work. Replace and restore at completion.

E. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished Work.

F. Remove debris and abandoned items from area and from concealed spaces.

G. Prepare surface and remove surface finishes to permit installation of new work and finishes.

H. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.

I. Remove, cut, and patch Work in manner to minimize damage and to permit restoring products and finishes to original condition.

J. Where new Work abuts or aligns with existing, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

K. When finished surfaces are cut so that smooth transition with new Work is not possible, terminate existing surface along straight line at natural line of division and submit recommendation to Architect/Engineer for review.

L. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing smooth transition; to Architect/Engineer for review.

M. Trim existing doors to clear new floor finish. Refinish trim to original condition.

N. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

O. Finish surfaces as specified in individual product sections.

P. Follow recommendations and methods described here to protect the Quality of Indoor Air:

Commonwealth of Massachusetts
Department of Public Health
Helping People Lead Healthy Lives In Healthy Communities

BUREAU OF ENVIRONMENTAL HEALTH

Indoor Air Quality Program

Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings

November 2006

Among the most serious indoor air quality health issues is potential exposure to construction/renovation-generated pollutants in occupied buildings. The renovation of occupied buildings provides a number of potential exposure opportunities to pollutants. Demolition of the building materials can provide exposure to mold, asbestos, lead, bird waste and other respiratory irritants. The application of tile adhesive, roofing materials, paints and other products used during renovations provide point sources of volatile organic compounds (VOCs) and other irritating chemicals.

Contractors frequently use fossil fueled construction and heating equipment in indoor areas undergoing renovations. Combustion products (e.g. carbon monoxide) can migrate into occupied areas. The impact of construction/renovation pollutants on occupied areas can be evaluated through air monitoring for VOCs, airborne particles and products of combustion. Preventing and/or minimizing exposure to construction/renovation-generated pollutants is essential to reduce indoor air-related symptoms in building occupants.

In 1999, the State Department of Education (DOE) amended their regulations to require that state funded construction projects follow established guidelines to prevent exposure of building occupants to construction/renovation pollutants. Subsequently, Chapter 208 of the Acts of 2004 transferred responsibility for the School Building Assistance Program from the DOE to the Massachusetts School Building Authority (MSBA). On September 6, 2006, the MSBA enacted regulations that require that schools receiving funds under the program for construction or renovation projects must confer with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 963 CMR 2.04(2)(c),(d).

The MDPH has prepared this guidance in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas and their potential impact on indoor air quality. The MDPH suggests that the following steps be taken on any renovation project within a public building.

Physical Isolation of Occupied Areas from Renovation Areas

Renovations of buildings should be separated from occupied areas by constructing temporary physical barriers. These barriers are typically constructed of plywood and polyethylene plastic built in or over passageways between the construction area and the occupied spaces. Construction barriers should be sealed with polyethylene plastic and duct tape on the construction side as well as the occupied side to provide a duel barrier. Inspection of these barriers should be conducted daily prior to commencement of construction activities to ensure integrity. A log of the location and condition of each barrier should be maintained in a log book.

Other migratory pathways for pollutants to move between construction and occupied areas should be examined and sealed. These migratory pathways may include but are not limited to:

- Crawlspaces
- Electrical outlets and light switches in shared walls
- Pipe and electrical conduits between walls
- Ventilation system ductwork
- Holes in interior walls and/or spaces above interior walls and roof/floor decking (e.g., spaces above ceiling tile systems).

Outdoor construction-generated pollutants can migrate indoors under various conditions. The following are recommendations to reduce migration of *outdoor* pollutants to the indoor environment:

- Seal around exterior doors with weather stripping and door sweeps to prevent infiltration of outdoor construction-generated pollutants.
- Cover with tarps any dirt/debris piles in close proximity to the building or wet down dirt/debris to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.
- Temporarily deactivate the HVAC system during construction generating high amounts of outdoor pollutants. If activity is longer than one day, alternative means of ventilation should be provided for the impacted areas. If not feasible, relocation of activities in these areas should be considered.

The Use of Pressurization/Depressurization Techniques

Construction sites should be isolated and depressurized compared with occupied areas to control for renovation pollutants. To achieve depressurization, use fans to draw air away from occupied areas. Use of the existing supply ventilation system to introduce fresh outside air into occupied space should be used to increase air pressure in occupied areas adjacent to construction activities. In order to assess whether depressurization has occurred, air pressure monitoring (using a micromanometer) to measure air pressure differential between occupied space and construction areas should be used. Monitoring should be done daily at each barrier to ensure appropriate pressurization. Results of the location, dates and results of air pressure monitoring should be kept in a log book. No construction work should occur in areas immediately adjacent to occupied areas if:

- Depressurization is not achieved,
- Air pressure monitoring has not been done that day, or
- Odor/construction related complaints have been made by occupants in adjacent areas.

Operation of the Existing Ventilation Systems

Precautions should be taken to avoid the *re-entrainment* of construction-related materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities and contingency plans to maintain adequate supply of fresh air and temperature must also be developed and implemented to maintain building occupant safety and comfort. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and using filters with a higher dust spot efficiency where needed.

Administrative Management to Prevent Exposure to Construction Generated Pollutants

Various administrative actions can also prevent occupant exposures to construction/renovation-generated pollutants. The following measures should be used to prevent, eliminate or reduce occupant exposure to construction-generated pollutants:

- Schedule projects that produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
- Develop a notification system for building occupants to report construction/renovation related odors and/or dust problems to the building administrator. These concerns should be relayed to the contractor in a manner to allow for a timely remediation of the problem.
- Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.
- Notify occupants about construction activities that may be conducted in close proximity to their work areas. In certain cases, areas adjacent to construction activities may need to have their HVAC equipment deactivated and windows closed periodically to prevent unfiltered air and vehicle exhaust from entering the building. For this reason, prior notification(s) should be made.
- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.
- Keep Material Safety Data Sheets (MSDS) for all construction materials used during renovations in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act.

Control/Reduction of Pollutants in Occupied Areas

Frequently, renovations include the replacement of components of the HVAC system, rendering windows as the only source of fresh air. In this environment, removal of normally occurring pollutants as well as construction-generated pollutants must be enhanced to reduce exposure.

The following recommendations are made to reduce exposure under these circumstances:

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This should include daily cleaning of occupied areas during the course of renovation work generating dust, fumes and other particulate materials.
- Consider increasing the number of personnel or work hours for existing staff (e.g., before school) to provide increased cleaning of dirt/dust accumulation in occupied areas due to construction/renovation activities.
- Control for dusts by using a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping/mopping of all surfaces.
- Cover with tarps any dirt/debris piles (indoors and outdoors) in close proximity to the building or wet down dirt/debris (outdoors) to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.

Inspection upon Request

The Massachusetts Department of Public Health, Bureau of Environmental Health, Indoor Air Quality Program, is available to inspect a public building upon receipt of a written request for inspection from and in cooperation with the appropriate government agency.

Questions

If you have any questions concerning these guidelines, please contact:

Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: (617) 624-5757 Fax: (617) 624-5777

Document Reviewed: August 2008

Q.

END OF SECTION

SECTION 013200

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 reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Unusual event reports.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. 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.

G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

1.4 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. Two paper copies, of sufficient size to display entire period or schedule, as required.

B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
3. Total Float Report: List of activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit at weekly intervals.

H. Site Condition Reports: Submit at time of discovery of differing conditions.

I. Unusual Event Reports: Submit at time of unusual event.

J. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing work stages area separations interim milestones and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's Construction Schedule with 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.

1.7 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

B. 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.

C. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. 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 the following long lead 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.

    a. Aluminum Windows, Aluminum Storefront and Doors, Ceramic Tile, Wheelchair Lift, HVAC; (ERVS, RTUs, AHUs, Controls).

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. 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: Include no fewer than 15 days for commissioning.
6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager'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.

D. 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. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. 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. Partial occupancy before Substantial Completion.
    e. Use-of-premises restrictions.
    f. Provisions for future construction.

g. Seasonal variations.
h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Phasing of Work
g. Sample testing.
h. Deliveries.
i. Installation.
j. Tests and inspections.
k. Adjusting.
l. Curing.
m. Building flush-out.
n. Startup and placement into final use and operation.
o. Commissioning.

8. Construction Areas: Identify each major area of construction for each major portion 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. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

9. Other Constraints: Roads, Parking, landscape development, playground relocation (Alternate #2 if selected by Owner).

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones:

1. Temporary enclosure and space conditioning.
2. Substantial completion of phased summer work including but not limited to:
   a. Computer Lab conversion to Language Classrooms (first summer).
   b. Cafeteria Expansion.
   c. Main Office reconfiguration (Alternate #1 if selected by the Owner).

F. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

G. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

H. 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.

I. 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.

J. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. 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.

1.8 CPM SCHEDULE REQUIREMENTS

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

    a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

    a. Preparation and processing of submittals.
    b. Mobilization and demobilization.
    c. Purchase of materials.
    d. Delivery.
    e. Fabrication.
    f. Utility interruptions.
    g. Installation.
    h. Work by Owner that may affect or be affected by Contractor's activities.
    i. Testing and inspection.
    j. Commissioning.
    k. Punch list and final completion.
    l. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

    a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents,and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

    a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
    b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall Project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

1.9 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
10. Unusual events.
11. Stoppages, delays, shortages, and losses.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Orders and requests of authorities having jurisdiction.
15. Change Orders received and implemented.
16. Construction Change Directives received and implemented.
17. Services connected and disconnected.
18. Equipment or system tests and startups.
19. Partial completions and occupancies.
20. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and 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.

D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

BUREAU OF ENVIRONMENTAL HEALTH
Indoor Air Quality Program

Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings

November 2006

Among the most serious indoor air quality health issues is potential exposure to construction/renovation-generated pollutants in occupied buildings. The renovation of occupied buildings provides a number of potential exposure opportunities to pollutants. Demolition of the building materials can provide exposure to mold, asbestos, lead, bird waste and other respiratory irritants. The application of tile adhesive, roofing materials, paints and other products used during renovations provide point sources of volatile organic compounds (VOCs) and other irritating chemicals. Contractors frequently use fossil fueled construction and heating equipment in indoor areas undergoing renovations. Combustion products (e.g. carbon monoxide) can migrate into occupied areas. The impact of construction/renovation pollutants on occupied areas can be evaluated through air monitoring for VOCs, airborne particles and products of combustion. Preventing and/or minimizing exposure to construction/renovation-generated pollutants is essential to reduce indoor air-related symptoms in building occupants.

In 1999, the State Department of Education (DOE) amended their regulations to require that state funded construction projects follow established guidelines to prevent exposure of building occupants to construction/renovation pollutants. Subsequently, Chapter 208 of the Acts of 2004 transferred responsibility for the School Building Assistance Program from the DOE to the Massachusetts School Building Authority (MSBA). On September 6, 2006, the MSBA enacted regulations that require that schools receiving funds under the program for construction or renovation projects must confer with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 963 CMR 2.04(2)(c),(d).

The MDPH has prepared this guidance in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas and their potential impact on indoor air quality. The MDPH suggests that the following steps be taken on any renovation project within a public building.

Physical Isolation of Occupied Areas from Renovation Areas

Renovations of buildings should be separated from occupied areas by constructing temporary physical barriers. These barriers are typically constructed of plywood and polyethylene plastic built in or over passageways between the construction area and the occupied spaces. Construction barriers should be sealed with polyethylene plastic and duct tape on the

construction side as well as the occupied side to provide a duel barrier. Inspection of these barriers should be conducted daily prior to commencement of construction activities to ensure integrity. A log of the location and condition of each barrier should be maintained in a log book.

Other migratory pathways for pollutants to move between construction and occupied areas should be examined and sealed. These migratory pathways may include but are not limited to:

- Crawlspaces
- Electrical outlets and light switches in shared walls
- Pipe and electrical conduits between walls
- Ventilation system ductwork
- Holes in interior walls and/or spaces above interior walls and roof/floor decking (e.g., spaces above ceiling tile systems).

Outdoor construction-generated pollutants can migrate indoors under various conditions. The following are recommendations to reduce migration of *outdoor* pollutants to the indoor environment:

- Seal around exterior doors with weather stripping and door sweeps to prevent infiltration of outdoor construction-generated pollutants.
- Cover with tarps any dirt/debris piles in close proximity to the building or wet down dirt/debris to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.
- Temporarily deactivate the HVAC system during construction generating high amounts of outdoor pollutants. If activity is longer than one day, alternative means of ventilation should be provided for the impacted areas. If not feasible, relocation of activities in these areas should be considered.

The Use of Pressurization/Depressurization Techniques

Construction sites should be isolated and depressurized compared with occupied areas to control for renovation pollutants. To achieve depressurization, use fans to draw air away from occupied areas. Use of the existing supply ventilation system to introduce fresh outside air into occupied space should be used to increase air pressure in occupied areas adjacent to construction activities. In order to assess whether depressurization has occurred, air pressure monitoring (using a micromanometer) to measure air pressure differential between occupied space and construction areas should be used. Monitoring should be done daily at each barrier to ensure appropriate pressurization. Results of the location, dates and results of air pressure monitoring should be kept in a log book. No construction work should occur in areas immediately adjacent to occupied areas if:

- Depressurization is not achieved,

- Air pressure monitoring has not been done that day, or
- Odor/construction related complaints have been made by occupants in adjacent areas.

Operation of the Existing Ventilation Systems

Precautions should be taken to avoid the *re-entrainment* of construction-related materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities and contingency plans to maintain adequate supply of fresh air and temperature must also be developed and implemented to maintain building occupant safety and comfort. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and using filters with a higher dust spot efficiency where needed.

Administrative Management to Prevent Exposure to Construction Generated Pollutants

Various administrative actions can also prevent occupant exposures to construction/renovation-generated pollutants. The following measures should be used to prevent, eliminate or reduce occupant exposure to construction-generated pollutants:

- Schedule projects that produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
- Develop a notification system for building occupants to report construction/renovation related odors and/or dust problems to the building administrator. These concerns should be relayed to the contractor in a manner to allow for a timely remediation of the problem.
- Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.
- Notify occupants about construction activities that may be conducted in close proximity to their work areas. In certain cases, areas adjacent to construction activities may need to have their HVAC equipment deactivated and windows closed periodically to prevent unfiltered air and vehicle exhaust from entering the building. For this reason, prior notification(s) should be made.
- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.
- Keep Material Safety Data Sheets (MSDS) for all construction materials used during renovations in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act.

Control/Reduction of Pollutants in Occupied Areas

Frequently, renovations include the replacement of components of the HVAC system, rendering windows as the only source of fresh air. In this environment, removal of normally occurring pollutants as well as construction-generated pollutants must be enhanced to reduce exposure.

The following recommendations are made to reduce exposure under these circumstances:

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This should include daily cleaning of occupied areas during the course of renovation work generating dust, fumes and other particulate materials.
- Consider increasing the number of personnel or work hours for existing staff (e.g., before school) to provide increased cleaning of dirt/dust accumulation in occupied areas due to construction/renovation activities.
- Control for dusts by using a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping/mopping of all surfaces.
- Cover with tarps any dirt/debris piles (indoors and outdoors) in close proximity to the building or wet down dirt/debris (outdoors) to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.

Inspection upon Request

The Massachusetts Department of Public Health, Bureau of Environmental Health, Indoor Air Quality Program, is available to inspect a public building upon receipt of a written request for inspection from and in cooperation with the appropriate government agency.

Questions

If you have any questions concerning these guidelines, please contact:

Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: (617) 624-5757 Fax: (617) 624-5777

Document Reviewed: August 2008

1. Phasing of the work
    a. June 27 – August 26, 2016 (First Summer):
        i. Mobilization on site; install construction fencing around western leg of parking lot and west wing expansion; install security measures (cameras & lighting); construct construction access road to west expansion area; clear trees and undergrowth for west wing expansion;
        ii. Construct base-bid parking expansion, including modifications to fire lane access around gymnasium; clear trees and undergrowth along parking lot;
        iii. Install temporary partitions as indicated by plans and specifications at interior of the building;
        iv. Renovation of existing computer lab into two classrooms; coordinate timeline of work with owner – owner will relocate computer classroom equipment;
        v. Relocate the A/V lab from the library to new space;
        vi. Install new door from main office at north wall;
        vii. Excavate for and place foundations and steel for west wing expansion;
        viii. Rough grade around west wing expansion;
        ix. Remove trees adjacent to cafeteria.
    b. School year 2016-2017:
        i. Erect superstructure and fully enclose west wing expansion; install temporary door in recess of southern classroom for construction activities to continue inside during the school year
        ii. Demolish existing cafeteria extension; excavate for and place foundations for cafeteria expansion; construct cafeteria superstructure and enclosure
        iii. December 26, 2016 through January 2, 2017 (Holiday break): construct temporary partition in library; finalize relocation of A/V room;
        iv. February 20 – 24, 2017 (Winter Break): Perform work necessary for field measurements, shop drawings, approvals and ordering for new stairs and lift; begin tie-in of new west wing infrastructure to the existing building infrastructure;
        v. April 17 – 21, 2017 (Spring Break): Continue work at new stair and lift; continue tying west wing expansion into existing construction;
        vi. June 27, 2017 (tentative latest date for summer break to start): All trades shall be prepared to begin work to complete project by start of 2017-2018 school year.
    c. June 27 – August 23, 2016 (Second Summer):
        i. Make all openings and complete expansion joints to tie west wing spaces into existing building via door openings and corridors; maintain all temporary partitioning as required; complete fitout of new spaces
        ii. Demolition of partitions, slab and ceilings for new stair; construct new corridor partitions and casework for library; installation of new stair and lift; complete construction of new stair, enclosure, and display;
        iii. Alternate #1 scope (if selected): construct temporary partitions to isolate work; start and complete all renovations to the main office, nurse's office and staff areas;
        iv. Alternate #2 scope (if selected): Perform all work associated with the relocation of the playground equipment; clear trees and undergrowth along parking lot; rough and final grading of site including retaining walls; construct parking lot expansion with loop road tie in.

2. See the Bedford Public Schools 2016 / 2017 school calendar for specific dates and times of school opening and closings. Other days for interior work may be possible with careful scheduling and communication with school administration and staff.

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8/30 New Teacher Class
8/31 New Teacher Orientation
9/1 Teachers First Day Back
9/6 First Day of School

Bedford Public Schools

2016 / 2017 Calendar

August				
M	T	W	TH	F
22	23	24	25	26
29	30	31		

September				(19)
			1	XX
XX	6	7 3/4	8	9
12`	13	14 3/4	15	16
19	20	21 3/4	22	23
26	27	28 3/4	29	30

October				(20)
M	T	W	TH	F
3	4	5 3/4	6	7
XX	11	12 3/4	13	14
17	18	19 3/4	20	21
24	25	26 3/4	27	28
31				

November				(18)
M	T	W	TH	F
	1	2 3/4	3	4
7	XX	9 3/4	10	XX
14	15	16 3/4	17	18
21	22	23h	XX	XX
28	29	30 3/4		

December				(17)
M	T	W	TH	F
			1	2
5	6	7 3/4	8	9
12	13	14 3/4	15	16
19	20	21 3/4	22	23
XX	XX	XX	XX	XX

January				(19)
M	T	W	TH	F
XX	3	4 3/4	5	6
9	10	11 3/4	12	XX
XX	17	18 3/4	19	20
23	24	25 3/4	26	27
30	31			

February				(15)
M	T	W	TH	F
		1 3/4	2	3
6	7	8 3/4	9	10
13	14	15 3/4	16	17
XX	XX	XX	XX	XX
27	28			

March				(22)
M	T	W	TH	F
		1 3/4	2	3
6	7	8 3/4	9	XX
13	14	15 3/4	16	17
20	21	22 3/4	23	24
27	28	29 3/4	30	31

April				(15)
M	T	W	TH	F
3	4	5 3/4	6	7
10	11	12 3/4	13	14h
XX	XX	XX	XX	XX
24	25	26 3/4	27	28

May				(22)
M	T	W	TH	F
1	2	3 3/4	4	5
8	9	10 3/4	11	12
15	16	17 3/4	18	19
22	23	24 3/4	25	26
XX	30	31 3/4		

June				(13)
M	T	W	TH	F
			1	2
5	6	7 3/4	8	9
12	13	14 3/4	15	16
19h				

School Days			
Sept	19	Feb	15
Oct	20	Mar	22
Nov	18	Apr	15
Dec	17	May	22
Jan	19	June	13
	93		**87**
TOTAL DAYS			**180**

2016 Holidays/Vacations		
2016		
Aug	19th	First day HS Football Practice
Aug	25th	First day all other HS Sports Practices
Sept	6th	First Day of School
Sept	6th	Kindergarten Orientation
Oct.	10th	Columbus Day (No School)
Nov.	11th	Veterans' Day (No School)
Nov.	23rd	Schools Close at Early Dismissal
Nov.	24-25	Thanksgiving Break
Dec.	26-2	Vacation

2017 Holidays/Vacations		
2017		
Jan.	2nd	Last day of Vacation
Jan.	3rd	Schools Reopen
Jan.	16th	Martin Luther King Day
Feb.	20-24	Winter Vacation
April	17-21	Spring Vacation
May	29th	Memorial Day
June	1st	High School Graduation
June	19th	Tentative Last Day of School

180 Days = June 19th (if no cancellations)
June 20th-26th (Possible make-up days for cancellations)

	New Teachers
	All Staff
XX	**No School**
h	**Early Dismissal**
3/4	**3/4 Day Workshops**
XX	**Teacher Prof. Development - No School for Students**

Tuesday, November 8th, 2016
Friday, January 13th, 2017
Friday, March 10th, 2017

Snow Days

	School Starting & Dismissal Times		Workshop Dismissal	Early Dismissal
Middle	7:40 A.M.	2:16 P.M.	12:43 P.M.	11:05 A.M
High	7:45 A.M.	2:24 P.M.	12:54 P.M.	11:15 A.M.
Lane	8:22 A.M.	2:46 P.M.	1:17 P.M.	11:40A.M.
Davis	9:02 A.M.	3:20 P.M.	1:55 P.M.	12:05 P.M.

Bedford School Committee Approved: February 9, 2016

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the drawings, and all other parts of the Contract Documents are hereby made a part of this section.

1.2 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed products list.

D. Product data.

E. Shop drawings.

F. Test Reports

G. Certificates.

H. Manufacturer's instructions.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with AIA Form G810 or Architect/Engineer accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Schedule submittals to expedite Project, and deliver to Architect/Engineer at its business address. Coordinate submission of related items.

F. For each submittal for review, allow 15 days excluding delivery time to and from Contractor.

G. Identify variations from Contract Documents and product or system limitations which may be detrimental to successful performance of completed Work.

H. Allow space on submittals for Contractor and Architect/Engineer review stamps.

I. When revised for resubmission, identify changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit preliminary outline Schedules in duplicate within 5 days after date of Owner-Contractor Agreement for coordination with Owner's requirements.

B. Submit revised Progress Schedules in duplicate with each Application for Payment.

C. Indicate estimated percentage of completion for each item of Work at each submission.

D. Include submittal dates for shop drawings, product data, and samples, including Owner furnished products, and dates reviewed submittals will be required from Architect/Engineer. Indicate decision dates for selection of finishes.

E. Revisions To Schedules:

1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

1.5 PROPOSED PRODUCTS LIST

A. Within 5 days after date of Owner-Contractor Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 PRODUCT DATA

A. Product Data: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Submit number of copies Contractor requires, plus two copies Architect/Engineer will retain.

C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

D. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01700.

1.7 SHOP DRAWINGS

A. Shop Drawings: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article and for record documents described in Section 01700.

1.8 SAMPLES

A. Samples: Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.

B. Samples For Selection as Specified in Product Sections:

1. Submit to Architect/Engineer for aesthetic, color, or finish selection.

2. Submit samples of finishes from full range of manufacturers' standard colors, or in custom colors selected, textures, and patterns for Architect/Engineer selection.

C. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

D. Include identification on each sample, with full Project information.

E. Submit number of samples specified in individual specification sections; Architect/Engineer will retain one sample.

F. Reviewed samples which may be used in the Work are indicated in individual specification sections.

1.9 TEST REPORTS

A. Submit for Architect/Engineer's knowledge as contract administrator or for Owner.

B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 CERTIFICATES

A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Architect/Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect/Engineer for delivery to Owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

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SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Section.

1.2 SECTION INCLUDES

A. Quality control and control of installation.

B. Tolerances

C. References.

D. Mock-up requirements.

E. Testing and inspection services.

F. Manufacturers' field services.

G. Examination.

H. Preparation.

1.3 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. When manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.5 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.

C. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

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SECTION 015 00 00

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 0110000 "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

C. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

D. 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. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions at each phase of work.
2. HVAC system isolation schematic drawing.
3. Location of proposed air-filtration system discharge.
4. Waste handling procedures.
5. Other dust-control measures.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch, 0.148-inch- thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch- OD line posts and 2-7/8-inch- OD corner and pull posts, with 1-5/8-inch- OD top rails.

B. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Architect, Construction Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with no fewer than one receptacle on each wall. Furnish room with conference table, chairs, and 4-foot- square tack and marker boards.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: 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 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 017700 "Closeout Procedures".

PART 3 - EXECUTION

3.1 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.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting

installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Connect temporary service to Owner's existing power source, as directed by Owner.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
   2. Install lighting for Project identification sign.

J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install 2 telephone line(s) for each field office.

   1. Provide additional telephone lines for the following:
      a. Provide one telephone line(s) for Owner's use.

   2. At each telephone, post a list of important telephone numbers.

      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Contractor's emergency after-hours telephone number.
      e. Architect's office.
      f. Engineers' offices.
      g. Owner's office.
      h. Principal subcontractors' field and home offices.

   3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

   1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until 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. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."
3. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Section 321216 "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary parking areas for construction personnel.

F. 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.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

   a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

I. 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 017300 "Execution."

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. 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 011000 "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 erosion- and sedimentation-control Drawings requirements of 2003 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 environmentally safe materials.

G. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As indicated on Drawings.
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 work day.

1. Install temporary security cameras at gated entrances and around stored materials.

2. Install security lighting around fenced areas.

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: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

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.
2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
    c. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 INDOOR AIR QUALITY

A. Employ methods from IAQ guidelines as follows:

Commonwealth of Massachusetts
Department of Public Health
Helping People Lead Healthy Lives In Healthy Communities

BUREAU OF ENVIRONMENTAL HEALTH
Indoor Air Quality Program

Methods Used to Reduce/Prevent Exposure to Construction/Renovation Generated Pollutants in Occupied Buildings

November 2006

Among the most serious indoor air quality health issues is potential exposure to construction/renovation-generated pollutants in occupied buildings. The renovation of occupied buildings provides a number of potential exposure opportunities to pollutants. Demolition of the building materials can provide exposure to mold, asbestos, lead, bird waste and other respiratory irritants. The application of tile adhesive, roofing materials, paints and other products used during renovations provide point sources of volatile organic compounds (VOCs) and other irritating chemicals. Contractors frequently use fossil fueled construction and heating equipment in indoor areas undergoing renovations. Combustion products (e.g. carbon monoxide) can migrate into occupied areas. The impact of construction/renovation pollutants on occupied areas can be evaluated through air monitoring for VOCs, airborne particles and products of combustion. Preventing and/or minimizing exposure to construction/renovation-generated pollutants is essential to reduce indoor air-related symptoms in building occupants.

In 1999, the State Department of Education (DOE) amended their regulations to require that state funded construction projects follow established guidelines to prevent exposure of building occupants to construction/renovation pollutants. Subsequently, Chapter 208 of the Acts of 2004 transferred responsibility for the School Building Assistance Program from the DOE to the Massachusetts School Building Authority (MSBA). On September 6, 2006, the MSBA enacted regulations that require that schools receiving funds under the program for construction or renovation projects must confer with the most current edition of the "IAQ Guidelines for Occupied Buildings Under Construction" published by the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) 963 CMR 2.04(2)(c),(d).

The MDPH has prepared this guidance in order to prevent/reduce the migration of renovation-generated pollutants into occupied areas and their potential impact on indoor air quality. The MDPH suggests that the following steps be taken on any renovation project within a public building.

Physical Isolation of Occupied Areas from Renovation Areas

Renovations of buildings should be separated from occupied areas by constructing temporary physical barriers. These barriers are typically constructed of plywood and polyethylene plastic built in or over passageways between the construction area and the occupied spaces. Construction barriers should be

sealed with polyethylene plastic and duct tape on the construction side as well as the occupied side to provide a duel barrier. Inspection of these barriers should be conducted daily prior to commencement of construction activities to ensure integrity. A log of the location and condition of each barrier should be maintained in a log book.

Other migratory pathways for pollutants to move between construction and occupied areas should be examined and sealed. These migratory pathways may include but are not limited to:

- Crawlspaces
- Electrical outlets and light switches in shared walls
- Pipe and electrical conduits between walls
- Ventilation system ductwork
- Holes in interior walls and/or spaces above interior walls and roof/floor decking (e.g., spaces above ceiling tile systems).

Outdoor construction-generated pollutants can migrate indoors under various conditions. The following are recommendations to reduce migration of *outdoor* pollutants to the indoor environment:

- Seal around exterior doors with weather stripping and door sweeps to prevent infiltration of outdoor construction-generated pollutants.
- Cover with tarps any dirt/debris piles in close proximity to the building or wet down dirt/debris to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.
- Temporarily deactivate the HVAC system during construction generating high amounts of outdoor pollutants. If activity is longer than one day, alternative means of ventilation should be provided for the impacted areas. If not feasible, relocation of activities in these areas should be considered.

The Use of Pressurization/Depressurization Techniques

Construction sites should be isolated and depressurized compared with occupied areas to control for renovation pollutants. To achieve depressurization, use fans to draw air away from occupied areas. Use of the existing supply ventilation system to introduce fresh outside air into occupied space should be used to increase air pressure in occupied areas adjacent to construction activities. In order to assess whether depressurization has occurred, air pressure monitoring (using a micromanometer) to measure air pressure differential between occupied space and construction areas should be used. Monitoring should be done daily at each barrier to ensure appropriate pressurization. Results of the location, dates and results of air pressure monitoring should be kept in a log book. No construction work should occur in areas immediately adjacent to occupied areas if:

- Depressurization is not achieved,
- Air pressure monitoring has not been done that day, or

- Odor/construction related complaints have been made by occupants in adjacent areas.

Operation of the Existing Ventilation Systems

Precautions should be taken to avoid the *re-entrainment* of construction-related materials into the building's HVAC system. The design of each system must be assessed to determine how it may be impacted by renovation activities and contingency plans to maintain adequate supply of fresh air and temperature must also be developed and implemented to maintain building occupant safety and comfort. Specific HVAC protection requirements pertain to the return, central filtration and supply components of the ventilation system. This may entail shutting down systems (when possible) during periods of heavy construction and demolition, ensuring systems are isolated from contaminated environments, sealing ventilation openings with plastic and using filters with a higher dust spot efficiency where needed.

Administrative Management to Prevent Exposure to Construction Generated Pollutants

Various administrative actions can also prevent occupant exposures to construction/renovation-generated pollutants. The following measures should be used to prevent, eliminate or reduce occupant exposure to construction-generated pollutants:

- Schedule projects that produce large amounts of dusts, odors and emissions during unoccupied periods or periods of low occupancy.
- Develop a notification system for building occupants to report construction/renovation related odors and/or dust problems to the building administrator. These concerns should be relayed to the contractor in a manner to allow for a timely remediation of the problem.
- Disseminate scheduling itinerary to all affected parties; this can be done in the form of meetings, newsletters or weekly bulletins.
- Notify occupants about construction activities that may be conducted in close proximity to their work areas. In certain cases, areas adjacent to construction activities may need to have their HVAC equipment deactivated and windows closed periodically to prevent unfiltered air and vehicle exhaust from entering the building. For this reason, prior notification(s) should be made.
- If possible, relocate susceptible persons and those with pre-existing medical conditions (e.g., hypersensitivity, asthma) away from areas of renovations.
- Keep Material Safety Data Sheets (MSDS) for all construction materials used during renovations in an area that is accessible to all individuals during periods of building operations as required by the Massachusetts Right-To-Know Act.

Control/Reduction of Pollutants in Occupied Areas

Frequently, renovations include the replacement of components of the HVAC system, rendering windows as the only source of fresh air. In this environment, removal of normally occurring pollutants as well as construction-generated pollutants must be enhanced to reduce exposure.

The following recommendations are made to reduce exposure under these circumstances:

- Implement prudent housekeeping and work site practices to minimize exposure to renovation pollutants. This should include daily cleaning of occupied areas during the course of renovation work generating dust, fumes and other particulate materials.
- Consider increasing the number of personnel or work hours for existing staff (e.g., before school) to provide increased cleaning of dirt/dust accumulation in occupied areas due to construction/renovation activities.
- Control for dusts by using a high efficiency particulate air filter (HEPA) equipped vacuum cleaner in conjunction with wet wiping/mopping of all surfaces.
- Cover with tarps any dirt/debris piles (indoors and outdoors) in close proximity to the building or wet down dirt/debris (outdoors) to decrease aerosolization of particulates, when possible.
- Change HVAC filters more regularly in areas impacted by renovation activities. Upgrading to more efficient filters for these units should also be considered.

Inspection upon Request

The Massachusetts Department of Public Health, Bureau of Environmental Health, Indoor Air Quality Program, is available to inspect a public building upon receipt of a written request for inspection from and in cooperation with the appropriate government agency.

Questions

If you have any questions concerning these guidelines, please contact:

Massachusetts Department of Public Health
Bureau of Environmental Health
Indoor Air Quality Program
250 Washington Street, 7th Floor
Boston, MA 02108
Phone: (617) 624-5757 Fax: (617) 624-5777

Document Reviewed: August 2008

B.

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. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017000 "Closeout Procedures."

END OF SECTION 015000

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Section.

1.2 SECTION INCLUDES

A. Products.

B. Product delivery requirements.

C. Product storage and handling requirements.

D. Product options.

E. Product substitution procedures.

F. Equipment electrical characteristics and components.

1.3 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.4 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.5 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

D. For exterior storage of fabricated products, place on sloped supports above ground.

E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

G. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.

H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

I. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Named Manufacturers: Products of one of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Named Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article. No requests for substitution will be accepted during the bid period.

1.7 PRODUCT SUBSTITUTION PROCEDURES

A. Architect/Engineer will consider requests for Substitutions only within 15 days after date of Owner-Contractor Agreement

B. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that Contractor:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.

2. Will provide same warranty for Substitution as for specified product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.

4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign services associated with re-approval by authorities having jurisdiction.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

F. Substitution Submittal Procedure:

1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.

2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.

3. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

G. Substitutions may be approved on the basis of a change order, with associated changes in contract cost and time, at the discretion of the Owner.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 70 00

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL PROVISIONS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Section.

1.2 SECTION INCLUDES

A. Substantial Completion.

B. Final Acceptance.

C. Punch List.

D. Final cleaning.

E. Protecting installed construction.

F. Manual for materials and finishes.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Submit specific warranties, maintenance service agreements, final certifications, and similar documents as indicated below.

3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include signed Certificate of

Inspection for Use and Occupancy from the Town Building Inspector, operating certificates, and similar releases.

4. Deliver tools, spare parts, extra materials, and similar items as indicated below. Label with manufacturer's name and model number where applicable.

5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

6. Complete final cleaning requirements, including touchup painting.

7. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect and Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate of completion will be issued. The time frame for the completion of the "punch list items" shall not exceed the completion date of the contract. Should the "punch list items" not be completed within the specified time frame, the Owner may invoke the rights provided under the General Conditions.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Section 01200 "Price and Payment Procedures."

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect and Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected. Contractor will compensate Owner for any additional charges submitted by Architect/Engineer for reinspections.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit two copies 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.

1.6 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

E. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

F. Clean site; sweep paved areas.

G. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.7 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

1.8 MANUAL FOR MATERIALS AND FINISHES

A. Submit two sets of final volumes within 10 days after final inspection.

B. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.

C. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

D. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

E. Additional Requirements: As specified in individual product specification sections.

F. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Construction waste management plan.
2. Construction waste recycling.
3. Construction waste adaptive reuse.

B. Related Sections:
1. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:
a. Environmental-protection measures during construction.
2. Section 022250 – SELECTIVE STRUCTURE DEMOLITION:
a. Demolition and elective demolition activities.

1.2 REFERENCES

A. ASTM International:
1. ASTM E1609 - Standard Guide for Development and Implementation of a Pollution Prevention Program.

1.3 PLAN REQUIREMENTS

A. Develop and implement construction waste management plan in accordance with ASTM E1609 and as approved by Owner and Architect/Engineer.

B. Use attached form as general format for waste management plan. All parts must be completed.

C. Intent:
1. Divert construction, demolition, and land clearing debris from landfill disposal.
2. Redirect recyclable material back to manufacturing process.
3. Generate cost savings or increase minimal additional cost to Project for waste disposal.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures Requirements for submittals.

B. Construction Plan: Submit construction waste management plan describing methods and procedures for implementation and monitoring compliance including the following:
1. Transportation company hauling construction waste to waste processing facilities.

2. Recycling and adaptive reuse processing facilities and waste type each facility will accept.
3. Construction waste materials anticipated for recycling and adaptive reuse.
4. On site sorting and site storage methods.

C. Submit documentation with each application for payment substantiating construction waste management plan was maintained and goals are being achieved.
1. Trash: Quantity by weight deposited in landfills. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal.
2. Salvaged Material: Quantity by weight with destination for each type of material salvaged for resale, recycling, or adaptive reuse. Include associated fees, transportation costs, container rentals, and taxes for total cost of disposal. Also include reimbursements due to salvage resale.
3. Total Cost: Indicate total cost or savings for implementation of construction waste management plan.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for submittals.

1.6 CONSTRUCTION WASTE MANAGEMENT PLAN

A. Construction Waste Landfill Diversion: Minimum 50 75 percent by weight of construction waste materials for duration of Project through resale, recycling, or adaptive reuse.

B. Implement construction waste management plan at start of construction.

C. Review construction waste management plan at pre-construction meeting and progress meetings specified in Section 01 30 00.

D. Distribute approved construction waste management plan to subcontractors and others affected by Plan Requirements.

E. Oversee plan implementation, instruct construction personnel for plan compliance, and document plan results.

F. Purchase Products to prevent waste by:
1. Ensuring correct quantity of each material is delivered to site.
2. Choosing products with minimal or no packaging.
3. Requiring suppliers to use returnable pallets or containers.
4. Requiring suppliers to take or buy-back rejected or unused items.

1.7 CONSTRUCTION WASTE RECYCLING

A. Use source separation method or co-mingling method suitable to sorting and processing method of selected recycling center. Dispose non-recyclable trash separately into landfill.

B. Source Separation Method: Recyclable materials separated from trash and sorted into separate bins or containers, identified by waste type, prior to transportation to recycling center.

C. Co-Mingling Method: Recyclable materials separated from trash and placed in unsorted bins or container for sorting at recycling center.

D. Materials required to be recycled include:
   1. Demolition Waste:
      a. Asphaltic concrete paving.
      b. Concrete and concrete reinforcing steel.
      c. Brick and concrete masonry units.
      d. Wood studs, wood joists, plywood, oriented strand board, paneling and trim.
      e. Casework and cabinetry.
      f. Structural steel, miscellaneous steel and rough hardware.
      g. Insulation.
      h. Doors, door frames and door hardware.
      i. Windows and glazing.
      j. Gypsum board (painted).
      k. Equipment.
      l. Plumbing fixtures, piping, supports, hangers, valves and sprinklers.
      m. Mechanical equipment and refrigerants.
      n. Electrical conduit, copper wiring, lighting fixtures, lamps, and ballasts.
      o. Electrical devices, switchgear, panelboards and transformers.
   2. Construction Waste:
      a. Site-clearing waste.
      b. Concrete and concrete reinforcing steel.
      c. Lumber, wood sheet materials and wood trim.
      d. Metals.
      e. Roofing.
      f. Insulation.
      g. Gypsum board (new unpainted scrap).
      h. Piping.
      i. Wire and cable
      j. Electrical conduit.
      k. Packaging: 100 percent of the following uncontaminated packaging materials: Paper, cardboard, boxes, plastic sheet and film, polystyrene packaging, wood crates, plastic pails.
      l. Equipment Oil.

1.8 CONSTRUCTION WASTE ADAPTIVE RE-USE

A. Arrange with processing facility for salvage of construction material and processing for reuse. Do not reuse construction materials on site except as accepted by Owner.

B. Materials required to be salvaged for reuse include:
   1. Concrete and crushed concrete.
   2. Masonry units.

3. Miscellaneous Steel
4. Lumber suitable for re-sawing or refinishing.
5. .

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION

3.1 CONSTRUCTION WASTE COLLECTION

A. Collect construction waste materials in marked bins or containers and arrange for transportation to recycling centers or adaptive salvage and reuse processing facilities.

B. Maintain recycling and adaptive reuse storage and collection area in orderly arrangement with materials separated to eliminate co-mingling of materials required to be delivered separately to waste processing facility.

C. Store construction waste materials to prevent environmental pollution, fire hazards, hazards to persons and property, and contamination of stored materials.

D. Cover construction waste materials subject to disintegration, evaporation, settling, or runoff to prevent polluting air, water, and soil.

3.2 CONSTRUCTION WASTE DISPOSAL

A. Deliver construction waste to waste processing facilities. Obtain receipt for deliveries.

B. Deliver receipts to architect accompanying applications for payment.

C. Dispose construction waste not capable of being recycled or adaptively reused by delivery to landfill, incinerator, or other legal disposal facility. Obtain receipt for deliveries.

END OF SECTION

PROJECT WASTE MANAGEMENT PLAN

Project Name:			
Project Location:			
Architect's Project #:		Contractor's Project #:	
Project Description:			

General Contractor:			
Address:			
Recycling Coordinator(s):		Telephone #:	

Architect:			
Address:			
Recycling Coordinator(s):		Telephone #:	

WASTE MANAGEMENT GOALS:

- This project will recycle, reuse, or salvage at least ___ of the waste generated on-site.
- Redirect recyclable material back to manufacturing process.
- Generate cost savings or increase minimal additional cost to Project for waste disposal.

COMMUNICATION PLAN:

- Waste prevention and recycling activities will be discussed at each job site meeting with GENERAL CONSTRACTOR employees and subcontractors.
- All GENERAL CONTRACTOR employees have been notified of GENERAL CONTRACTOR'S chosen Comingling and/or Source Separation & Recycling Plan on all GENERAL CONTRACTOR'S projects and are obligated to comply with the plan.
- All GENERAL CONTRACTOR employees and subcontractors will receive a copy of this Waste Management Plan (WMP) for *the above stated project*.
- The subcontract used for this project clearly requires all subcontractors to comply with GENERAL CONTRACTOR'S WMP.
- Any incidence of contamination of source separated waste materials by a subcontractor will result in a $_____ fine (per the subcontract.)
- All recycling containers will be clearly labeled.
- GENERAL CONTRACTOR will submit detailed reports concurrent with applications for payment documenting types and quantities (tons) of materials recycled, reused, salvaged, and disposed.

EXPECTED PROJECT WASTE & HANDLING METHOD:

The following charts identify the expected waste materials and their expected methods of handling. The handling methods include but are not limited to the following: recycling, reuse, salvage, and disposal. The expected handling methods and/or plan may change if necessary. If additional materials are encountered, they will be added to this chart.

MATERIAL	HANDLING METHOD	PLAN
Asphalt	Recycle	
Brick	Recycle Reuse/Salvage	
Concrete	Recycle	
Concrete with Rebar	Recycle	
Ledge	Recycle	
Metal (steel, aluminum, copper, beverage containers, others)	Recycle	
Metal Doors (36"x70")	Salvage	
Clean Wood	Recycle	
Wood Stumps	Recycle	
Wood Doors	Salvage	
Gypsum Board (10,000 SF Old Demo)	Dispose	
Gypsum Board (100,000 SF New generates 10,000 SF Scrap)	Recycle	
Cardboard	Recycle	
Lighting Fixtures (Halide/Sodium Lamps & Recessed Fluorescent Boxes)	Recycle	
Electrical (Conduit & Wiring)	Recycle	
Carpet	Recycle	
Glass (Glass Block & Windows)	Recycle	
Office Furniture (Panel Desk Cubicles, Metal File Cabinets, Metal Bookcases)	Salvage	
HVAC Duct	Recycled	
HVAC Duct Insulation	Dispose	
Other Insulation	Recycle	
VCT/Linoleum	Dispose	
Other Packaging Material (Plastics, Foam, etc.)	Recycle	
White Paper	Recycle	
Hazardous Materials	Dispose	Disposed by authorized hazardous wastes handler. See Hazardous Materials Report and remediation specification
Misc. Materials & Any Non-recyclable material from above	Dispose	

SECTION 02 41 09

SELECTIVE STRUCTURE 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:
   a. Demolish partitions and appurtenances as indicated on demolition drawings.
   b. Create new openings in roof at reconfigured main communicating stair.
   c. Demolish and remove masonry "fin "extensions at west wing, both beyond walls and above the roof.
   d. Demolish and remove masonry along corridor wall adjacent to northwest classrooms.
   e. Demolish and remove all curtain wall and glazing at existing cafeteria extension.
   f. Demolish and remove existing slab and foundations walls at existing cafeteria extension.
   g. Demolition of existing storefront panel and glazing at existing main office as indicated on the drawings (BASE BID).
   h. Remove and dispose of main communicating stair.
   i. Remove and dispose of ramp at library.
   j. Remove and store all existing doors and hardware scheduled for reuse.
   k. Demolish finished floors as indicated on the drawings.
   l. Demolish ceiling grid and tiles as indicated on the drawings.
   m. Demolish existing casework as indicated on the drawings.
   n. Remove and terminate all plumbing to be abandoned in place
   o. Remove plumbing both domestic water supply and sanitary drainage back to point of extension for new plumbing locations.
   p. Remove and terminate all HVAC to be abandoned in place.
   q. Remove HVAC including duct work, piping and equipment back to point of extension for new HVAC locations.
   r. Remove and terminate electrical branch circuitry, devices and lighting to be abandoned in place.
   s. Remove electrical circuitry back to point of extension for new electrical circuits, lighting and locations.
2. Alternate #1: Alterations and Reconfiguration of Main Office
   a. Demolish partitions and appurtenances as indicated on demolition drawings.
   b. Create new openings in roof at existing conference room.

c. Remove and store all existing doors and hardware scheduled for reuse.
d. Demolish finished floors as indicated on the drawings.
e. Demolish ceiling grid and tiles as indicated on the drawings.
f. Demolish existing casework as indicated on the drawings.
g. Remove and terminate all plumbing to be abandoned in place
h. Remove plumbing both domestic water supply and sanitary drainage back to point of extension for new plumbing locations.
i. Remove and terminate all HVAC to be abandoned in place.
j. Remove HVAC including duct work, piping and equipment back to point of extension for new HVAC locations.
k. Remove and terminate electrical branch circuitry, devices and lighting to be abandoned in place.
l. Remove electrical circuitry back to point of extension for new electrical circuits, lighting and locations.

B. Related Requirements:

1. Division 01 Section "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Division 01 Section "Execution" for cutting and patching procedures.
3. Section 01 50 00 Temporary Facilities and Controls, **special emphasis on Indoor Air Quality requirements.**
4. Division 21 00 01 Fire Protection
5. Division 22 00 01 Plumbing Filed –Sub-Bid
6. Division 23 00 01 HVAC Filed Sub-Bid
7. Division 26 00 00 Electrical Filed Sub-Bid

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and recycled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Pre-demolition Conference: Conduct conference at **Project site**.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Review testing for adhesive compatibility.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

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. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Pre-demolition Photographs or Video: Submit before Work begins.

F. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed recycled.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If any suspected hazardous materials of any sort are encountered, do not disturb; immediately notify Architect and Owner.

E. Protection Areas: Demolition and hauling equipment and other materials shall be of sizes that clear surfaces with in spaces, areas, rooms, and openings, including temporary protection, by 12 inches or more.

F. Storage or sale of removed items or materials on-site is not permitted.

G. 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 so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. None anticipated.

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.

PART 2 - PRODUCTS

2.1 PEFORMANCE 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 ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been protected or disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of **preconstruction photographs** and **preconstruction videotapes**.

1. Comply with requirements specified in Division 01 Section "Photographic Documentation."
2. Inventory and record the condition of items to be removed and salvaged. Provide **photographs or video** of conditions that might be misconstrued as damage caused by salvage operations.
3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated 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.
2. Arrange to shut off indicated utilities with utility companies.
3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
4. Disconnect, demolish, and remove fire-suppression systems and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: 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. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
3. Cover and protect furniture, furnishings, and equipment that have not been removed.
4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents

of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. In "Existing Items to Remain" Paragraph below, option for cleaning existing items to remain before reinstalling adds cost. Revise to suit Project.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch (19 mm) at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

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 Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Burning: Not allowed!

D. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 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.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Existing Construction to Be Removed:
   1. Slab sections identified on the drawings.
   2. Existing piping, ductwork, electrical feeders and equipment, controls as indicated on drawings and in Division 25 and Division 26.

B. Existing Items to Remain:
   1. Existing ductwork, electrical feeders, and piping designated on the drawings

END OF SECTION 02 41 09

Section 024113. 23

UTILITY LINE REMOVAL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

B. Examine all other Sections of the Specifications and drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section or implied on the drawings.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 RELATED DOCUMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section.

B. Section 31 00 00 - EARTHWORK.

C. Section 31 10 00 - SITE PREPARATION.

D. Section 31 25 00 - EROSION AND SEDIMENT CONTROL.

E. Section 33 10 00 – WATER SYSTEM.

F. Section 33 30 00 – SANITARY SEWAGE SYSTEM.

G. Section 33 40 00 – STORM DRAINAGE SYSTEM

1.3 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, services and transportation required to complete all site preparation work as shown on Drawings, as specified herein, or both.

B. Include the following work:
   1. Adjusting frame, grate and rim elevations of existing storm drainage, sanitary sewer, gas, electrical, and water utilities to remain.

1.4 PERMITS AND CODES

A. All work shall comply with applicable codes, ordinances, rules, regulations and laws of all local, municipal, and state authorities having jurisdiction. All work necessary to make site preparation comply with such requirements shall be provided without additional cost to the Owner.

B. Procure and pay for all permits and licenses required for work under this Section. Give all required notices.

C. Do not close or obstruct any roads, sidewalks, alleys, or passageways, unless approved by the Town of Winthrop. No materials whatsoever shall be placed or stored within the site without approval of the Owner. Conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways, alleys, sidewalks, and other facilities near enough to the Work to be affected.

1.5 PROJECT CONDITIONS

A. Locate, protect, and maintain benchmarks, monuments, control points and project engineering reference points. Re-establish disturbed or destroyed items at no additional expense to the Owner.

B. Perform site utilities work operations and the removal of debris and waste materials to assure minimum interference with streets, walks, and other adjacent facilities.

C. Obtain written permission from the Town when required to close or obstruct roads, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways.

D. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

E. Protect existing buildings, paving, and other services or facilities adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items shall be at no additional expense to the Owner.

F. Protect and maintain lights, utility poles and services, valves and other services, except items designated for removal. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.

G. Adjust rim elevations on utility access structures such as manholes, clean outs, etc. to be flush with new grade elevations, unless otherwise indicated on drawings

H. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the applicable utility company, the Engineer immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Perform site utilities preparation work before commencing construction.

B. Locate, protect, and maintain active utilities and site improvements to remain. Consult the records and drawings of adjacent work and of existing services and utilities which may affect site work operations.

C. Provide necessary barricades, coverings, and protection to prevent damage to existing improvements to remain.

D. Restore to original grades and conditions, areas adjacent to site disturbed or damaged as a result of site utilities preparation work.

E. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.

3.2 REMOVAL/ABANDONMENT OF EXISTING SITE UTILITIES IMPROVEMENTS.

A. Remove and/or abandon existing site utilities improvements within the limit of work line as indicated. Include the following:
   1. Miscellaneous utilities (electric, telephone, gas, etc.)
   2. Water service and their appurtenances.
   3. Storm drainage and their appearances.
   4. Sanitary sewer and their appearances.

B. Existing Utilities: Information on the Drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.

C. Remove existing paving, including base material, as required to accommodate new construction. Saw cut existing paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work.

3.3 FRAMES, GRATE, AND COVERS TO BE SALVAGED

A. Existing frames, grates and covers shall be carefully removed from existing structures.

B. Existing frames, grates and covers shall be cleaned and be free of any concrete, soil or deleterious material.

C. Existing frames, grates and covers shall be stored and protected until they are used.

D. Surplus frames, grates and covers shall become property of the Contractor and shall be dispose of at the Contractor's expense.

3.4 UTILITIES STRUCTURES AND PIPES TO BE REMOVED

A. Utilities structures and pipes to be removed shall be completely removed.

B. Drainage, sanitary sewer and water pipes sections to be removed shall be cut and completely removed. Remaining, abandoned pipes should be capped.

C. The base material for the structures shall be removed to a point 6 inches below the top of the existing subgrade. The cavity shall be completely filled in accordance with the applicable material for the specific area as described in the earthwork specifications.

3.5 UTILITIES STRUCTURES TO BE RESET

A. When the line or grade, or both the line and grade of the structure require a change of 6-inches or less, the structure shall be adjusted to line and grade. The masonry shall be removed to such a depth as directed by the Architect and new masonry shall be constructed to conform to the proposed design.

B. When the line and grade, or both the line and grade of the structure require a change greater than 6-inches, the structure shall be removed to such depths as directed by the Architect, and new masonry shall be constructed to conform to the new design.

3.6 DISPOSAL OF WASTE MATERIALS

A. Remove, haul from site, and legally dispose of all waste materials and debris not required to be saved. Accumulation is not permitted.

B. Maintain disposal routes clear, clean, and free of debris.

C. On-site burning of combustible cleared materials is not permitted.

D. Cover trucks used for hauling, follow approved routes, obtain disposal permits required and pay all fees in connection with disposal of materials removed.

E. Upon completion of site preparation work, clean areas of work, remove tools and equipment. Provide site clear, clean, and free of materials and debris and suitable for site construction operations.

3.7 SALVAGEABLE MATERIALS

A. Remove and stockpile all materials indicated to be salvaged.

B. Salvaged items shall include granite curbing, suitable topsoil, and fill materials and other materials indicated to be saved and/or re-used.

C. All removed materials, items, and equipment not indicated to be saved or returned to the Town of Winthrop Department of Public Works (DPW) shall be the property of the Contractor and shall be removed from the site and legally disposed of.

D. Remove non-salvage materials from site as work progresses. Storage and sale of Contractor's salvage items on site is not permitted.

END OF SECTION

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SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to work specified in this Section.

1.02 SUMMARY

A. This Section specifies Cast-in-Place Concrete including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes for the following:

1. Footings.

2. Foundation walls.

3. Slabs on-grade.

4. Suspended slabs.

5. Non-shrink Grout

B. Related Sections include the following:
1. Division 2, Section “Earthwork” for drainage fill under slabs on-grade.
2. Division 2, Section “Cement Concrete Pavement” for walks.
3. Division 3, Section “Cast-in-Place Architectural Concrete” for general building applications of specially finished formed concrete.
4. Section 01741 – DEMOLITION WASTE MANAGEMENT AND DISPOSAL
5. Section 01742 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.03 SUBMITTALS

A. Product Data: Submit data for proprietary materials and items, including reinforcement, form liners and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others as requested by A/E.

B. Shop Drawings - Reinforcements: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Details and Detailing for Reinforced Concrete Structures" showing type and grade of steel reinforcing, bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required for openings through concrete structures. Indicate sequence of concrete placing for coordinating reinforcing steel splices at construction joints.

1. Scaled dimensions from structural drawings shall not be used to determine lengths of reinforcing bars.

2. Shop drawings shall be of such detail and completeness that all fabrication and placement at the site can be accomplished without the use of project or contract drawings for reference.

3. Contractor shall check architectural, structural, mechanical, and electrical project or contract drawings for anchor bolt schedules and locations, anchors, inserts, conduits, sleeve, and any necessary provisions as required so that reinforcing steel will not interfere with the placement of such embedded items.

4. Reinforcing steel shall not be fabricated or placed before the shop drawings have been reviewed by the A/E and returned to the Contractor. Review of shop drawings by the A/E will not relieve the Contractor of responsibility for errors or failure in accuracy and complete placing of the work.

5. Submit two prints plus a reproducible sepia.

C. Shop Drawings - Formwork: Submit for record only, one complete set of formwork design computations and one set of formwork shop drawings. Show form construction including jointing, special form joint or reveals location and pattern of form tie placement, and other items which affect exposed concrete visually. All submitted computations and shop drawings shall be prepared under the direct supervision of an Engineer licensed to practice in the State of Massachusetts, and shall be sealed and signed by said Engineer prior to submission.

D. Samples: Submit samples of materials as requested by A/E, including names, sources, and descriptions.

E. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design.

1. The concrete design mix shall be reviewed by the testing laboratory before being submitted to A/E for review.

F. Curing Methods: The General Contractor shall submit its proposal methods for curing of concrete to the Designer for approval not less than 10 days prior to placement of any concrete.

G. Daily Record: The General Contractor shall maintain an accurate daily record of the locations in which concrete is placed and shall furnish a certified copy of this record to the A/E.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, latest edition except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings". Two copies shall be furnished by the General Contractor for use in the field by the General Contractor and the Resident Engineer.

2. ACI 318 "Building Code Requirements for Reinforced Concrete".

3. ACI 347 "Recommended Practice for Concrete Formwork".

4. ACI 315 "Details and Detailing for Reinforced Concrete Structures".

5. U.S. Dept. of Commerce, U.S. Product Standard psi, "Softwood Plywood - Construction and Industrial".

6. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

B. Concrete Testing Service: Refer to Division 1 (Quality Control Services) for general testing procedures.

C. Materials and installed work may require testing and retesting at anytime during progress of work. Tests, including retesting of rejected materials for installed work, shall be done at Contractor's expense.

D. Compliance With Standard and Industry Specifications: Material or operation specified by reference to published specification of a manufacturer, the American Concrete Institute (ACI), the Portland Cement Association, the Concrete Reinforcing Steel Institute (CRSI), local building code, or other published standard, shall comply with requirements of current specification or standard listed. In case of conflict between referenced specification and project specification, project specification shall govern. In case of conflict between referenced specifications or standards, the one having more stringent requirements shall govern.

E. Project Conditions:

1. Protection of Footings Against Freezing: Cover completed work with sufficient temporary cover as required to protect concrete and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.

2. Protect adjacent finish materials against spatter during concrete placement.

3. Protection of Reinforcing Materials: Protect reinforcing materials from rusting and damage. Store off the ground using pallets, platforms, or other supports in a dry ventilated space or protect with suitable waterproof coverings.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

1. Earth forms may be used for footings where soil is firm and stable and concrete will not be exposed.

C. Form Coatings: Provide commercial formulation non-grain raising and non-staining type form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces. Coating containing mineral oils or other non-drying ingredients will not be permitted.

D. Form Ties and Spreaders:

1. Form ties and spreaders not subjected to hydrostatic pressure shall be standard metal form clamp assembly of type acting as spreaders and leaving no metal within one inch of concrete face. Inner tie rods shall be the crimped type to insure a water-tight tie. They shall not be fitted with lugs, cones, washers or other devices to act as a spreader within forms, or for any purpose which would leave hole or depression back of exposed surface of concrete. Inner tie rod shall be left in concrete when forms are removed. Submit samples and manufacturer's specifications to the A/E for review before using. No wire ties or wood spreaders will be permitted.

2. Form ties and spreaders subjected to hydrostatic pressure shall be standard metal form clamp assembly of type acting as spreaders and leaving no metal within 1-1/2 inches of concrete face. The assembly should provide cone-shaped depressions at the forms at the surface at least 1 inch in diameter and 1-1/2 inches deep to allow filling and patching. Inner tie rod shall be crimped type to insure a watertight tie and be left in concrete when forms are removed. Submit samples and manufacturer's specifications to the A/E for review before using. No wire ties or wood spreaders will be permitted.

E. Framing, studding and bracing shall be Douglas Fir or Southern Pine, Rough or S4S.

G. Expansion joint filler shall be preformed, non-extruding resilient type, in accordance with ASTM D 1752 (non-bituminous type), with sealer where indicated. ASTM D 1751 (bituminous type) for joints where a sealer is not required.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

D. Welded Deformed Steel Wire Fabric: ASTM A 497.

E. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI specifications.

1. Material such as stone, brick, wood blocking or other non-approved materials shall not be used.

2. Supports shall be capable of sustaining 300 lbs. without deformation or deflection.

F. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

G. Materials shall be free of scaling rust at time of placement.

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type II.

1. Use one brand of cement throughout project, unless otherwise acceptable to A/E.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.

C. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

E. Admixtures shall conform to ASTM C 494.

1. Water-Reducing Admixture: ASTM C 494, Type A, and containing not more than 0.1 percent chloride ions.

2. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G and containing not more than 0.1 percent chloride ions.

3. Water-Reducing, Non-Chloride Accelerator Admixture: ASTM C 494, Type E, and containing not more than 0.1 percent chloride ions.

4. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and containing not more than 0.1 percent chloride ions.

5. Prohibited Admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 percent chloride ions are not permitted.

2.04 RELATED MATERIALS:

A. Vapor Barrier: Provide polyethylene sheet, 6 mils thick conforming to ASTM E 154..

B. Non-Shrink, Non-Staining Grout: CRD-C 621, factory pre-mixed grout. Conforming to the following requirements:

1. Portland Cement shall be high-early strength conforming to ASTM C 150, Type III.

2. Aggregate shall be specially selected conforming to ASTM C 33, fine aggregate.

3. Shrinkage-elimination aggregate of type normally used by manufacturer and capable of with standing impact without fracturing.

4. Has an initial setting time of approximately one hour or less at 70 degrees F.

5. Produces no settlement or drying shrinkage at three days or thereafter.

6. Resists attack by oil and water and has lower absorption than plain cement grout of the same flowability.

7. Grout shall develop minimum ultimate compressive strength of 10,000 psi at 28 days when tested in the form of 2" cubes.

8. Grout shall not contain any corrosive irons, harmful aluminums, calcium chloride or other chemicals.

C. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gal., applied in three applications on a wet cured slab surface in accordance with the manufacturer's recommendations.

D. Silane Sealer: One-part hydrophobic silane penetrating sealer with 40% solids concentration.

E. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

F. Moisture-Retaining Cover: One of the following, complying with ASTM C 171, Type 1 or 2.

1. Waterproof paper.

2. Polyethylene film.

G. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ASTM C 309, Type I, Class A, 30% minimum solids content. Moisture loss not more than 0.055 gr./sq. cm. when applied at 200 sq. ft./gal. Shall not be used in areas where it is not compatible with the slab finish.

H. Bonding Compound: Polyvinyl acetate or acrylic base.

I. Epoxy Adhesive: ASTM C 881, two component material suitable for use on dry or damp surfaces. Provide material "Type", "Grade", and "Class" to suit project requirements.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to A/E for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.

Concrete mix design shall be the responsibility of the ready-mix supplier, subject to review of the A/E.

B. Submit written reports for review by the testing laboratory and the A/E of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by A/E.

C. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. 4000 psi 28-day compressive strength, normal weight; W/C ratio, 0.58 maximum (non-air-entrained) 0.46 maximum (air-entrained), minimum cement factor 6.5 BAGS/C.Y.

2. 3000 psi 28-day compressive strength, normal weight; W/C ratio, 0.58 maximum (non-air-entrained) 0.46 maximum (air-entrained), minimum cement factor 5.5 BAGS/C/Y.

D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by A/E. Request for the use of adjusted mix shall be accompanied by test reports, from Contractor retained testing laboratory, prepared for this project, showing compatibility with actual ingredients being used in reviewed concrete mix and reporting effect on workability, strength and air content of both fresh and hardened concrete.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

F. Admixtures: Conforming to ASTM C 494.

1. Water-reducing admixture or high range water-reducing admixture (super plasticizer) in concrete as required for placement and workability.

2. Non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees F (10 degrees C).

3. High-range water-reducing admixture in pumped concrete, concrete for industrial slabs, architectural concrete, parking structure slabs, concrete required to be watertight, and concrete with water/cement ratios below 0.50.

4. Air-entraining admixture in exterior exposed concrete, unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus-or-minus 1-1/2 percent.

a. Air content of concrete exposed to freezing and thawing shall be 5% to 7%. Air content of interior slabs, subject to abrasion, shall have a minimum air content of 3%. Air content of other concrete is optional.

5. Admixtures for water-reducing and set-control in strict compliance with manufacturer's directions.

G. Water-Cement Ratio: For concrete which is subjected to freezing and thawing, provide concrete with maximum water-cement (W/C) ratio of 0.50.

H. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1.	Walls or base slabs	2" to 4"
2.	Beams, columns, or formed slabs	3" to 4"
3.	Slabs on grade or pavement slabs	1" to 3"

4. Concrete containing HRWR admixture (super-plasticizer): Not more than 8" after addition of HRWR to site-verified 2"-3" slump concrete.
5. Other concrete: Not more than 4".

I. Maximum Coarse Aggregate Size:
1. Beams, columns, walls less than 10", formed slabs, slabs on grade, and pavement slabs: 3/4"
2. Footings, walls more than 10": 1-1/2"

2.06 CONCRETE MIXING

A. Work shall be in accordance with ACI 304. Mixing and placing capacity shall be sufficient to keep work alive, and free from cold joints.

B. Concrete shall be machine mixed. Provide adequate equipment and facilities for accurate measurement and control of materials, to permit changing proportions to conform with varying conditions of work.

1. Use ready-mix concrete throughout, in accordance with ASTM C 94 unless specifically permitted otherwise. Plant shall have sufficient capacity and transportation equipment to deliver at rate required.
   a. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.

PART 3 - EXECUTION

3.01 FORMS

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Camber where necessary to assure level finished soffits. Maintain formwork construction tolerances complying with ACI 347. Arrange formwork to allow proper erection sequence.

B. Design formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.

C. Construct forms to sizes, shapes, lines, and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste. Tape panel joints to prevent protrusions in concrete. Form inside corners with mitered joint so no concrete is placed against form ends.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

E. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

F. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints. Chamfer shall be 3/4" wide, 45 degree angle.

G. Form Ties: Form ties not subjected to hydrostatic pressure shall be factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal. Ties shall be placed at least 1-inch away from the surface of the concrete. All form ties shall be spaced equidistant and symmetrical and shall line up both vertically and horizontally.

1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.

H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

1. Electrical and telephone conduits shall be run in concrete only after review by the A/E. Under no circumstances will aluminum conduit be permitted in concrete. No plumbing pipes of any sizes will be permitted in concrete wall or slabs.

2. No piping, conduit, sleeves or embedded items shall be placed between form and bottom slab bars, nor above top slab bars.

3. Do not cut or displace reinforcing steel to accommodate embedded items.

4. In walls or slabs, sleeves and conduit shall not be larger than 1/4 slab or wall thickness and shall be placed in the middle two quarters of that thickness.

5. Sleeves or conduit larger than 1/6 slab or wall thickness shall be run approximately parallel, or at right angles to reinforcement.

6. Piping or sleeves nearly parallel shall be spaced not less than 3 diameters o.c.

7. Contractor shall be held responsible for proper coordination of all work of this nature in order that there will be no unnecessary cutting and patching of concrete. Any cutting and repairing to concrete required as a result of failure to provide for such openings shall be performed at no additional expense to the Owner.

I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Before concrete is placed in any form, the horizontal and vertical position of the form shall be carefully verified and all inaccuracies corrected. All bracing shall be completed in advance of concrete cement. Retightening forms and bracing after concrete placement is required to eliminate mortar leaks and maintain proper alignment.

3.02 VAPOR BARRIER INSTALLATION

A. Following leveling and tamping of granular base for slabs on grade, place vapor barrier sheeting with longest dimension parallel with direction of pour.

B. Lap joints 6" and seal with appropriate tape.

C. After placement of moisture barrier, cover with granular material and compact to depth as shown on drawings.

3.03 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. Avoiding cutting or puncturing vapor barrier during reinforcement placement and concreting operations.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. Additional bars shall be supplied whether specifically shown on the drawings or not, where necessary, to fasten reinforcement in place. Support legs of accessories in forms without embedding in form surface. Hooping and stirrups shall be accurately spaced and wired to the reinforcing. No work will be permitted inside forms.

D. Place reinforcement to obtain at least minimum coverages for concrete protection as specified herein. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Reinforcing shall be rigidly tied at all splices and at all

crossing points and intersections in the position shown or as directed. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

1. Where center to center spacing between parallel bars is not shown, the clear spacing shall be 2 times the bar diameter but in no case less than 1-1/2 inches nor less than 1-1/3 times the maximum size aggregate.

2. Laps of splices shall be as shown or noted on drawings; however, splices of adjacent bars shall be staggered wherever possible.

3. Rebending of reinforcing bars on the job site to fix existing conditions will not be permitted without review by the A/E.

4. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh, but not less than 6 inches, and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either directions. Lift fabric into proper position while concrete is being placed.

5. Dowels shall be tied securely in place before concrete is deposited. In the event there are not bars in position to which dowels may be tied, No. 3 minimum shall be added to provide proper support and anchorage. Bending of dowels after placement of concrete will not be permitted.

6. Except where shown otherwise on drawings, the minimum concrete coverage for steel reinforcement shall be as follows:
   a. 3" for footings, pile caps and other principle structural member, for concrete deposited against ground.
   b. 2" for concrete exposed to ground but placed in forms.
   c. 2" for concrete exposed to the weather.
   d. 3/4" for slabs and walls not exposed to ground or to weather.
   e. 3/4" for welded wire fabric in slabs.
   f. 1-1/2" for column ties, beam and girder stirrups.
   g. Thickness of concrete cover over reinforcement shall be not less than diameter of round bars.

7. Capable steel workmen shall be kept on the work at all times during the placing of concrete and shall properly reset any reinforcement displaced by runways, workmen, or other causes.

8. The following reinforcing steel work will be considered defective and may be ordered by the A/E to be removed and replaced by the Contractor at no additional cost to the Owner.
   a. Bars with kinks or bends not shown on drawings.
   b. Bars injured due to bending or straightening.
   c. Bars heated for bending.
   d. Reinforcement not placed in accordance with the drawings and/or specifications.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to A/E.

B. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, except as otherwise indicated.

D. Rate and method of placing concrete and arrangement of construction joint bulkheads in foundation walls shall be such that concrete between construction joints shall be placed in lengths not exceeding 50' (total linear length between joints in any direction) except that in exposed foundation and retaining walls, joints shall be placed in lengths not exceeding 20' or as indicated. Keys shall be approximately 1/3 wall thickness in width, and 1/2 key width in thickness.

E. Joints in reinforced slabs and beams shall be perpendicular to axis of surface of member jointed, and at center of span. If an intersecting member occurs at that point, joint shall be located at nearest point of minimum shear. Provide additional vertical bar reinforcement if deemed necessary.

F. Construction joints in walls or piers shall be at bottom on connecting beam or girder. Whenever necessary to stop work, such stops shall be located at center of slabs and of beams, or as directed.

G. Floor slabs on grade shall be placed in strip sequence with construction and control joints as indicated. Contractor may, at his own option, submit for review, other methods of forming joints and location of joints.

1. If joint pattern not shown, provide joints not exceeding 20' in either direction and located to conform to bay spacing wherever possible (at column center lines, half bays, third-bays).

2. Control joints in unexposed floor slabs may be formed with T-shaped preformed plastic strips or by saw cuts 1/8" x .25 slab depth, as soon as possible after slab finishing as may be safely done without dislodging aggregate.

3.05 INSTALLATION OF EMBEDDED ITEMS

A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.06 PREPARATION OF FORM SURFACES

A. Clean re-used forms of concrete matrix residue, repair and patch as required to return forms to acceptable surface condition. Do not re-use any form for exposed work which cannot be reconditioned to like-new condition.

B. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.

C. Thin form-coating compounds only with thinning agent of type, amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

D. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

3.07 CONCRETE FLATWORK

A. General: Work under this section shall be in accordance with ACI 302, "Recommended Practice for Floor and Slab Construction", with regard to placement, screeding, leveling, floating and troweling. Surface crazing, with resultant failure due to excessive shrinkage and weakness of mortar at surface, shall be minimized through strict adherence to principles of correct finishing operations.

B. Preparation for Concreting:

1. Fine-grade surface to required sub-grade. Remove debris, trash, and loose stones. Additional fill, if required, shall be placed in accordance with Section 02200.

2. Place reinforcing mesh if required with joints lapped and tied together.

3. Edge forms and intermediate screed strips shall be set accurately to produce designed elevations and contours in finished surface. Screeds shall be adequately supported to avoid movement while placing concrete.

4. Dampen, (areas where vapor barrier is not required) but do not saturate, sand prior to placing concrete, sufficiently to permit compaction. Sand will take up excess water from slab and permit earlier finishing operation.

5. Obtain review of conditions when ready to place concrete. Inspection of buried piping, conduit, embedded items and of reinforcement shall be made prior to concreting.

3.08 CONCRETE PLACEMENT

A. Placement Preparation:

1. Remove accumulation of water from areas to be concreted, prior to depositing concrete. No concrete shall be placed in water. Provide diversion of flow of water away from freshly placed concrete.

2. Remove rubbish, dirt, grease or other foreign matter from form surfaces, reinforcement, and from within forms.

3. Prior to depositing new concrete in contact with adjoining surface of concrete which has acquired initial set, prepare construction joints as specified.

4. Screeds required for establishing surface grades of slabs on grade shall be accurately set and maintained to produce tolerance herein required. Screed supports for concrete over vapor barrier membranes shall be of a cradle, pad, or base type which will not puncture the membrane. Staking through the membrane will not be permitted.

5. Do not bear ends of runways on forms unless suitably shored to prevent movement of forms during concreting. Suitable access for trucks shall be provided.

6. Provide adequate protection during concreting operations when ambient temperature is 40 degrees F or below, or when, in opinion of A/E, temperature will fall below this limit within 24-hour period following placement of concrete. Do not place concrete in contact with frozen ground. Remove ice or snow from forms and reinforcement.

7. Do not place concrete until keys, sleeves, electric conduits, piping or other embedments have been inspected.

8. Adequate and appropriate vibrating equipment, tools and labor shall be on hand at time of depositing concrete to place and compact concrete as specified.

B. Preplacement Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, construction joints, bulkheads and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

1. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

2. Obtain review by A/E prior to placing concrete.

3. Notify appropriate parties two (2) working days in advance (whenever possible) when various parts will be ready for inspection.

4. Provide convenient and free access for inspection of any part.

5. Review of formwork by A/E shall not relieve Contractor of responsibility for safety and satisfactory design of formwork.

C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete" and as herein specified. Mixing and placing capacity shall be sufficient to keep work alive and free from cold joints.

1. Should concrete arrive at project with slump below that suitable for placing, water may be added only if neither minimum permissible water-cement ratio nor maximum slump is

exceeded. Added water shall require additional mixing time, equal to at least half of total mixing required. Addition of water above that permitted by limitation of water-cement ratio must be accompanied by amount of Portland cement sufficient to maintain required water-cement ratio. Such addition must be reviewed by control technician.

2. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

3. Concrete shall not be dropped freely where reinforcing will cause segregation, nor shall it be dropped freely more than six (6) feet. Concrete shall be deposited to maintain a plastic surface approximately horizontal.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" to avoid flowing along forms and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. In placing columns, walls or thin sections of heights greater than 10 feet, openings in the form, elephant trunk tremies, or other approved devices shall be used which will permit the concrete to be placed without segregation or accumulation of hardened concrete on the forms or metal reinforcement above the level of the fresh concrete. Such devices shall be installed so the concrete will be dropped vertically.

E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, reading or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309 recommended practices.

1. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically (not dragged horizontally) at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into receding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and on the embedded items without causing segregation of mix.

2. Internal vibrators shall maintain speed of not less than 8,000 vibrations per minute when in operation, submerged in concrete. Number of vibrations used shall be sufficient to consolidate concrete properly. At least one standby vibrator shall be on hand while concrete is being placed. Maintenance parts and service facilities shall be provided to prevent downtime of vibrator equipment. Vibration shall be close to the forms but shall not be continued at one spot to the extent that large areas of grout are formed or the heavier aggregates are caused to settle. Care shall be taken not to disturb concrete which has its initial set. Vibrators shall not be lowered deeper than the layer placed.

F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Placing, consolidating, striking off and leveling shall be performed prior to "bleeding" of concrete. Do not permit concrete to remain in buggies, barrows or buckets longer than necessary. After concrete has been consolidated and struck off, level and smooth concrete surface with darby or bull-float.

3. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, freed of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

G. Maintain reinforcing in proper position during concrete placement operations.

H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 deg. F (4 deg. C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg. F (10 deg. C) and not more than 80 deg. F (27 deg. C) at point of placement.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt or other materials containing anti-freeze agents or chemical accelerators, unless otherwise accepted in mix designs.

I. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg. F (32 deg. C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total mount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.

J. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

K. Pumped concrete may be used if first reviewed by the A/E for the location proposed. Equipment for pumping shall be of such size and design as to insure a practically continuous

flow of concrete at the delivery end without separation of materials. The concrete mix shall be designed to the same requirements as herein before specified and may be richer in lubricating components in order to allow proper pumping. The coarse aggregate content may not be lowered unless reviewed by the A/E. Concrete from the mixer used to prime the pump shall not be placed in the forms and shall be disposed of. Water shall not be added to the mix at the pump while placing concrete.

3.09 FINISH OF FORMED SURFACES

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This is the concrete surface having texture imparted by form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or other similar system. This is as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

D. Unspecified Finish: If the finish is not indicated, the following finishes shall be used as applicable:
   1. Rough Form Finish: For all concrete surfaces not exposed to public view.
   2. Smooth Form Finish: For all concrete interior surfaces exposed to public view.

3.10 MONOLITHIC SLAB FINISHES

A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and as otherwise indicated.

   1. After placing slabs, plane surface so that depressions between high spots do not exceed 1/2" under a 10' straight edge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set, with stiff brushes, brooms, or rakes.

B. Float Finish: Apply float finish to monolithic slab surface to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

   1. After screeding, consolidating, and leveling concrete slabs, surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to

power units. Check and level surface plane so that depressions between high spots do not exceed 5/16" under at 10' straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

C. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating, system.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled so that depressions between high spots do not exceed 1/8" under a 10" straight edge. Grind smooth surface defects which would telegraph through applied floor covering system.

D. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with A/E before application.

F. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors where indicated in finish schedule. Apply liquid chemical-hardener after complete curing and drying of the concrete surface. Dilute liquid hardener with water (parts of hardener/water as follows), and apply in 3 coats; first coat, 1/3-strength; second coat, 1/2-strength; third coat, 2/3-strength. Evenly apply each coat, and allow 24 hours for drying between coats.

1. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.

2. After final coat of chemical-hardener solution is applied and dried, remove surplus hardener by scrubbing and mopping with water.

G. Silane Sealer Finish: Apply penetrating silane sealer finish to interior concrete floors and trench drains where indicated in finish schedule. Apply sealer after complete curing and drying of the concrete surface. One coat of sealer to be applied at the coverage rate of 175 FT^2/gal.

1. Apply silane sealer in accordance with manufacturer’s printed instructions.

H. Concrete Slabs to receive Epoxy Flooring:

1. Concrete slabs to receive epoxy flooring shall be prepared in accordance with the flooring manufacturer's requirements. Slabs shall have no hardener applied and be mechanically troweled to a level hard dense surface.

2. Top surface of slab shall be planer within 1/8" inch in 10 feet and be left free of dips, ridges and other irregularities and be sloped to all floor drains.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods.
   a. Keep concrete surface continuously wet by covering with water.
   b. Continuous water-fog spray.
   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

2. Provide moisture-cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape of adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Provide curing and sealing compound to exposed interior slabs and to exterior slabs, walks, and curbs, as follows: Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period. Protect surface from standing or running water which would tend to emulsify or remove curing compound.

4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to A/E.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs, and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of appropriate curing method.

1. Final cure concrete surfaces to receive liquid floor hardener or finish flooring by use of moisture-retaining cover, unless otherwise directed.

E. Curing Trench Drains: Cure trench drain surfaces by flooding such that concrete surface is kept continuously covered with water for full curing period.

3.12 REMOVAL OF FORMS

A. General: Removal of forms shall be in accordance with requirements of ACI 318 and ACI 301 without damage to concrete, and in a manner to insure complete safety of structure. Leave shoring in place until concrete member will safely support its own weight plus live loads placed upon it, without damage.

B. Minimum time for forms and shoring to remain in place shall be as follows:
1. Structural slabs and beams - 14 days
2. Soffits of openings in walls - 14 days
3. Walls, columns and beam sides - 3 days
4. Slabs on grade and sides of footings - 3 days

C. Form facing material may be removed four days after placement, only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

D. Any request for earlier removal of form and shoring shall be made to the A/E in writing, along with supporting evidence that the safety of the structure will not be impaired. Contractor shall prepare test cylinders in accordance with ASTM C 39, at his own expense, as supporting evidence for earlier form removal.

E. In removing plywood forms, no metal pinch bars shall be used and special care shall be taken in stripping. Start at top edges or vertical corner where it is possible to insert wooden wedges. Wedging shall be done gradually and shall be accompanied by light tapping on the plywood panels to crack them loose. Do not remove forms with a single jerk after it has been started at one end.

F. Forms shall be left in place as long as possible to permit shrinkage away from concrete, and plywood forms shall be left in place until all other forms around are stripped and until there is no danger of damaging the architectural concrete due to other work in the vicinity.

G. Nothing herein shall be construed as relieving the Contractor of any responsibility for the safety of the structure.

H. After stripping, Contractor shall properly protect all concrete to be exposed in the finish work from damage, with boards and non-staining building paper to prevent staining, spalled edges, chips, etc.

3.13 RE-USE OF FORMS

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to A/E.

3.14 MISCELLANEOUS CONCRETE ITEMS

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

D. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions.

E. Steel Pan Stairs: Provide concrete fill for steel pan stair treads and landings and associated items. Concrete shall attain a strength of 5,000 psi at 28 days using 1/4 inch maximum size aggregate. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and finish concrete surfaces with steel trowel finish unless otherwise scheduled.

F. Exterior Equipment Pads: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.

G. Sidewalks: Provide sidewalks as shown on drawings.

3.15 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to A/E.

B. Cut out honeycomb, rock pockets, voids over 1/4" in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

C. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement (1 part cement to 3 parts sand) so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

D. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of A/E. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding agent.

E. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.

F. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness using a template having required slope.

G. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

H. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

I. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to A/E.

J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose

particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

L. Perform structural repairs with prior approval of A/E for method and procedure, using specified epoxy adhesive and mortar.

M. Repair methods not specified above may be used, subject to acceptance of A/E.

3.16 REMEDIAL WORK DUE TO CRACKING

A. Cracking of concrete work under this section due to settlement of filled areas, resulting in differential settlement of slab, poor workmanship, excessively wet concrete, or other causes shall be evaluated by A/E.

B. If, in his opinion, cracks are caused by poor workmanship, failure to adhere to specifications, or improper use of slab after placing, Contractor shall satisfactorily repair such cracks, using methods reviewed by A/E. In general, epoxy adhesives or epoxy mortars will be required, rather than cementitious material.

3.17 TESTING BY OWNER’S TESTING LABORATORY DURING CONSTRUCTION

A. Refer to Section 01400, "Quality Requirements," for general testing requirements.

B. Review concrete mix designs, submitted by the Ready-Mix supplier, for each type, class and pump mix.

C. Sampling and testing for quality control during placement of concrete will include the following, as specified and as directed by A/E.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94. Where concrete is placed by pumping, secure samples from discharge end of hose.

2. Slump: ASTM C 143; one test at point of discharge for each day's placement of each type of concrete at time test cylinders are made; additional tests when concrete consistency seems to have changed.

3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete at time test cylinders are made.

4. Concrete Temperature: Test hourly when air temperature is 40 deg. F (4 deg. C) and below, and when 80 deg. F (27 deg. C) and above; and each time a set of compression test cylinders made.

5. Compression Test Specimen: Mold four specimens from each sample, in accordance with ASTM C 31. All cylinders in a set will be marked with a number on one end. After

24 hours in the field, three cylinders will be delivered to the testing laboratory, in accordance with ASTM C 31. The fourth cylinder will be cured at the job site under field conditions. The testing laboratory representative will deliver the cylinders to the laboratory.

6. One set of cylinders for each day's pour exceeding 5 cu. yds. plus additional sets for each 100 cu. yds. over and above the first 25 cu. yds. of each concrete class placed in any one day.

7. Compressive Strength Tests: One cylinder from each set will be tested at seven days for information and two cylinders from each set will be tested at 28 days for acceptance. Testing shall be in accordance with ASTM C 39. The fourth cylinder from each set shall be kept at the job site until the 28 day test report has been received by the A/E. If this report is satisfactory, remove and dispose of the fourth cylinder. In the event that the 28 day test results are below the required strength, the laboratory will then test the fourth cylinder at the age selected by the A/E.

D. Test results will be reported in writing to A/E, within 24 hours after tests. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete in structure, design compressive strength at 28 days, slump, concrete temperature, air temperature, air-entrained content; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

1. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

E. Failure to Meet Strength Requirements:

1. If strength tests fail to meet these strength requirements, concrete represented by such tests shall be considered questionable, and shall be subject to further testing.

2. Impact hammer, sonoscope, or other non-destructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

3. Additional tests of questionable concrete shall be conducted at expense of Contractor in accordance with ASTM C 42.

4. Additional tests of hardened concrete may be required by A/E even though strength requirements are met when, in his opinion, there is cause for concern over adequacy of the structure. Contractor shall not be required to pay for such tests unless test results confirm that concrete is place is deficient.

5. The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by A/E. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other

methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

6. If results of these tests show actual strength of concrete sufficiently low to jeopardize performance of structure. A/E may require that concrete in question be removed from structure, and replaced, at no additional cost to Owner.

F. Contractor's Duties:

1. The Owner's testing laboratory will use concrete samples, provided by the Contractor at the point of concrete discharge, so that he may before the test specified in 3.17 C. The Contractor shall allow the Owner's testing laboratory free access to work, and provide a working area, and the required concrete samples for his testing and castings. The Contractor shall provide, and relocate as necessary, a temperature controlled container, with thermometer, at the point of testing for the purpose of storing concrete cylinders overnight.

2. The Contractor shall notify the Owner a minimum of 24 hours in advance of a scheduled concrete delivery.

END OF SECTION 03310

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SECTION 048100
UNIT MASONRY ASSEMBLIES
(FILED SUB-BID REQUIRED)

PART 1- GENERAL

1.00 FILED SUB-BID REQUIREMENT

A. The Masonry filed sub-bid includes the Work specified in the following Sections:
   1. 04810, Unit Masonry Assemblies

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings: A-1.0, A-1.2, A-2.0, A-3.0, A-3.1, A-3.2, A-5.0, A-5.1, A-5.2, A-5.3, A-5.4 & A-6.0.

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary General Conditions, and Division 1 General Requirements, apply to work specified in this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Brick veneer, applied to steel stud back-up.
   2. Masonry through-wall flashing.
   3. Insulation in air space (between veneer and sheathing).
   4. Infill of existing masonry.

B. Products installed but not furnished under this Section include the following:
   1. Loose steel lintels: Section 055000.
   2. Reglets in masonry joints for metal flashing: Section 076200.
   3. Anchors and inserts furnished under other sections of the specifications.

C. Products furnished but not installed under this section:
   1. Dowels to concrete trade for tying reinforced masonry walls into the floor slab.
   2. Dovetail anchor slots, to concrete trade.

D. Temporary Facilities: Furnish, install and maintain in safe and adequate condition all staging and scaffolding that are necessary for the proper execution of the work in this Section. The requirements of Section 01500, Temporary Construction Facilities and Controls, pertaining to staging, do not apply to this section of the specifications. Provide hoists and lifts for receiving masonry materials and moving them on the site. Remove these facilities from the site when they are no longer needed for construction.

E. Related Work Specified in Other Sections:
   1. Furnishing loose steel lintels: Section 055000.
   2. Wood nailers and blocking built into unit masonry: Section 061000.
   3. Exposed sheet metal flashing; furnishing reglets built into masonry: Section 076200
   4. Erecting hollow metal door frames: Section 081100.
   5. Electrical boxes and conduit built into unit masonry: Division 26.
   6. Furnishing of items to be built into masonry: Various sections of the specifications.

1.03 REFERENCED STANDARDS

A. ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602: "Building Code Requirements for Masonry Structures" and "Specification for Masonry Structures."

B. National Concrete Masonry Association (NCMA) "Tek Manual for Concrete Masonry Design and Construction.

1.04 SUBMITTALS

A. Product Data: Manufacturer's specifications, supporting technical data, and where applicable, handling, mixing, installation and maintenance instructions for the following:
   1. Each type of masonry unit.
   2. Reinforcing bars.
   3. Mortar pigments.
   4. Masonry accessories, including horizontal joint reinforcing, veneer anchors, masonry ties, other masonry anchors, expansion joint strips, bond breaker strips, and weeps.
   5. Through-wall flashing.
   6. Proprietary masonry cleaners.

B. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcing" showing bar schedules, stirrup

spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

C. Samples for initial selection purposes of the following:
   1. Unit masonry samples in small-scale form showing full extent of colors and textures available for each different exposed masonry unit required; except for standard concrete unit masonry.
   2. Colored masonry mortar samples showing full extent of colors available.

D. Samples for verification purposes of the following:

   l. Full-size units for each different exposed masonry unit required showing full range of exposed color, texture, and dimensions to be expected in completed construction.

   2. Colored masonry mortar samples for each color required showing the full range of colors expected in the finished construction. Label samples to indicate type and amount of colorant used.

   3. Masonry accessories, including horizontal joint reinforcing, and each type of masonry tie and anchor.

   4. Through-wall flashing.

F. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
   l. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
   2. Each material and grade indicated for reinforcing bars.
   3. Each type and size of joint reinforcement.
   4. Each type and size of anchors, ties, and metal accessories.

G. Material test reports from a qualified independent testing laboratory employed and paid by Contractor for each of the items listed below. Include test results and interpretation test results relative to compliance with the specifications.
   1. Masonry units.

H. Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, telephone numbers, names of Architects and Owners, and other information specified.

I. Cleaning program indicating cleaning process, including protection of surrounding materials on building and Project site, and control of runoff during operations. Describe in detail the materials, methods, and equipment to be used.1.06 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency employed to perform testing

specified in this section shall be an independent testing laboratory, and shall demonstrate to the Architect's satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM C 1093, that it has the experience and capability to conduct satisfactorily the testing indicated without delaying the progress of the Work.

B. Preconstruction Testing: Employ and pay a qualified independent testing laboratory to perform the following preconstruction testing to establish compliance of proposed materials and construction with specified requirements:

1. Clay unit masonry tests: Test each different clay masonry unit per ASTM C 67.

2. Concrete Masonry Unit Tests: Test each different concrete masonry unit for strength, absorption, and moisture content per ASTM C 140.

3. Evaluate mortar composition and properties per ASTM C 780.

C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

D. Source Limitations for Masonry Units: For each different product required for each continuous surface or visually related surfaces, furnish exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics. To achieve this uniformity, obtain units from one manufacturer, from a single factory, and from a single production run, unless quantity required exceeds the quantity which can be produced in a single run.

E. Source Limitations for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source and producer for each aggregate.

F. Chemical Manufacturer Qualifications: A company regularly engaged in producing masonry cleaners that have been used for similar applications with successful results, and with factory- trained representatives who are available for consultation and Project site inspection and assistance at no additional cost.

G. Mock-Ups: Prior to installation of unit masonry, erect sample wall panels to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:

1. Locate mock-ups on site in locations indicated or, if not indicated, as directed by Architect.
2. Build mock-ups for the following types of masonry; include accessories.
   a. Typical exterior masonry veneer on steel stud back up. Erect sample panel 6' wide by 4' high consisting of brick with precast trim, including studs, sheathing, building felt, flashing and accessories. Coordinate with trades flashing responsible for steel studs and sheathing.
   b. Typical interior masonry wall infill; sample panel 4' x 4'.
3. Erect panels parallel to existing masonry walls, to facilitate comparison for appearance.
4. Notify Architect one week in advance of the dates and times when mock-ups will be erected.
5. Protect mock-ups from the elements with weather-resistant membrane.
6. Retain and maintain mock-ups during construction in undisturbed condition as standard for judging completed unit masonry construction.
   a. When directed, demolish and remove mock-ups from Project site.

H. Preinstallation Conference: Conduct conference at Project site to discuss layout and installation of masonry, protection of the work during installation, and coordination with related and intersecting and penetrating work. Comply with requirements for Project Meetings in Section 01300 00, "Administrative Requirements."

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.

C. Store cementitious materials off the ground, under cover, and in dry location.

D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

1.08 PROJECT CONDITIONS

A. Protection of Masonry: During erection, cover tops of walls,

projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

2. Where 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. Do not apply uniform loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread 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 on completed masonry.

D. Cold-Weather Requirements: Do not lay brick or block masonry when the outside air temperature is below 40°F, except where weather protection materials have been furnished and installed by the General Contractor in accordance with Section 015000, Construction Facilities and Temporary Controls. Heating and covering of masonry materials as required by this paragraph shall be the responsibility of the Masonry Subcontractor.

1. Heat masonry materials to 40°F immediately before installation.

2. Do not use anti-freeze or accelerator admixtures in the mortar.

3. Do not build upon frozen work. Remove work which was built upon frozen work.

4. Properly cover sections of completed masonry and cure at temperature of at least 40°F for at least 24 hours after installation; for grouted masonry, cure for at least 24 hours after placement of grout.

5. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot Weather Construction: When the ambient air temperature exceeds 100°F (38°C), or exceeds 90°F (32°C) with a wind velocity greater than 8 mph 913 km/h), do not spread mortar beds more than 4 feet (1.2 m) ahead of masonry, and set masonry units within 1 minute of spreading mortar.

PART 2- PRODUCTS

2.01 BRICK

A. Face Brick: ASTM C 216, Grade SW, and Type FBS and as follows:

1. Unit Compressive Strength: 10,000 psi minimum average gross area compressive strength, based on test of 5 samples.

2. Initial Rate of Absorption: Between 5 and 20 g/30 sq. in. (g/194 sq. em) per minute when tested per ASTM C 67.

3. Saturation Coefficient (Ratio of absorption after 24 hours soak to absorption after 5 hours boil): Maximum 0.58 average of 5 brick; 0.60 individual.

4. Size: Standard Modular, 3-5/8 inches thick by 2-1/4 inches high by 7-5/8 inches long, within the tolerances specified in ASTM C 216.

5. Manufacturing Method: Molded brick, sandstruck or waterstruck.

6. Color and Texture: Intent is to match the existing brick, which was a custom blend.
Furnish Stiles and Hart "Windsor Blend" or approved equal in same color and texture blend. Proportions of color will be determined in the mock-up.

7. Manufacturers: Subject to compliance with requirements, furnish brick manufactured by Stiles and Hart, Morin Brick, Glen Gerry, or Boral Bricks, Inc.

B. Provide special molded shapes where indicated and as follows:

1. For applications requiring brick of form, color, texture, and size on exposed surfaces that cannot be produced by sawing standard brick sizes.

2. For applications where stretcher units cannot accommodate special conditions including those at corners, movement joints, bond beams, sashes, and lintels.

C. Provide units without cores or frogs and with all exposed surfaces finished for ends of sills, caps, and similar applications that expose brick surfaces that

otherwise would be concealed from view.

2.02 CONCRETE MASONRY UNITS

A. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, GradeN, normal weight, Type I, moisture controlled units, and as follows:

1. Unit Compressive Strength: 2500 psi minimum average net area compressive strength.

2. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.

3. Size: 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.

B. Provide special shapes where indicated, and for applications where stretcher units cannot accommodate special conditions including those at comers, movement joints, bond beams, sashes, and lintels.

1. Comer Units for Interior Veneer: Provide bullnose units at outside comers of interior masonry veneers, whether or not it is shown on the Drawings.

2.03 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144, except for joints less than 114 inch use aggregate graded with 100 percent passing the No. 16 sieve.

D. Aggregate for Grout: ASTM C 404.

E. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

1. Acceptable Products: Provide one of the following:
   a. "True Tone Mortar Colors," Davis Colors, A Subsidiary of Rockwood Industries,
      Inc.
   b. "SGS Mortar Colors," Solomon Grind-Chem Services, Inc. F.

F. Water: Clean and potable.

2.05 JOINT REINFORCEMENT

A. Manufacturers: Subject to compliance with requirements, provide joint reinforcement by one of the following:
   1. Dur-O-Wal, Inc.
   2. Hohmann & Barnard, Inc.
   3. National Wire Products Industries.

B. Material: Galvanized carbon-steel wire, coating class ASTM A 153, Class B-2 (1.50 oz/ft2), for both interior and exterior walls.

C. Clay Masonry Veneer (Brick): Continuous deformed rods 0.1483 (3.9 mm) diameter.

D. E. Concrete Unit Masonry Walls (Nominal Thickness Greater Than 4 Inches): Ladder type truss design; two parallel deformed continuous side rods 0.1483 (3.8 mm) diameter, with plain cross rods of the same size spaced 16 inches on center.

F. Where continuity of reinforcing is indicated at comers and intersections, furnish special L- shaped units for comers and tee-shaped units for intersecting walls, fabricated of same size wire and same rod spacing as straight units.

2.06 TIES AND ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide ties and anchors by one of the following:
   1. Dur-O-Wal, Inc.
   2. Hohmann & Barnard, Inc.
   3. National Wire Products Industries.

B. Material and Corrosion Protection:

   1. Wire Tie Material: Galvanized carbon steel wire, ASTM A 82, ASTM A 153 Class B2.

   2. Anchor Material: ASTM A 366 (commercial quality) cold-rolled carbon steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 153, Class B2 (for unit lengths over 15 inches) and Class B3 (for unit lengths under 15 inches), for sheet metal ties and anchors.

   3. Rigid Anchors: Galvanized Heavy-Thickness Steel Sheet: ASTM A 635 (commercial quality) hot-rolled carbon steel sheet hot-dip galvanized after fabrication to comply with ASTM A 525, Class B3, for rigid anchors fabricated from steel sheet or strip with a thickness of 0.180 inch and greater.

C. Exterior Masonry Veneer Ties: For attachment over sheathing to metal studs, furnish two- piece screw-attached masonry veneer anchor assemblies which allow vertical differential movement between masonry and back-up

construction and resist tension and compression forces perpendicular to it.

1. Structural Performance Characteristics: Capable of withstanding a 100 lbf load in either tension or compression without deforming over, or developing play in excess of 0.05 inch.

2. Anchor Section: 12 gage sheet metal plate, with raised strap or projecting tabs to accept adjustable tie; anchored to studs with two fasteners per tie. Furnish one of the following products:
   a. "D/A 213," Dur-0-Wal, Inc.
   b. "DW-10-HS," Hohmann & Barnard, Inc.

3. Wire Tie Section: 0.188 inch diameter galvanized steel wire, length as required to extend 1.5 inches into masonry wythe of veneer face, shape appropriate to type of anchor, as follows:a. With Dur-O-Wall D/A 213 series anchors: Box tie with pintles spaced to fit into legs of the anchor section.
   a. With Hohmann & Barnard DW-10 series anchors: Triangular tie, to minimize lateral movement.

4. Screws: Steel drill screws for steel studs, complying with ASTM C 954 except with hex washer head and neoprene washer, #10 diameter by length required to penetrate steel stud flange by not less than 3 exposed threads, with organic polymer coating with salt-spray resistance to red rust of more than 800 hours per ASTM B 117.
   a. Acceptable Products: ITW Buildex "Traxx" with "Ciimaseal" coating; or Elco Industries, Inc, "Drii-Fiex" with "Stalgard" coating.

5. Neoprene Gaskets: Screw-attached masonry veneer anchor manufacturer's standard closed cell neoprene gaskets manufactured to fit behind anchor plate and to prevent moisture from penetrating through screw holes to steel studs behind sheathing.

D. Interior Masonry Veneer Ties: Provide seismic strap anchor formed with a pair of shear lugs designed to engage pencil rod or seismic ladder type reinforcing; Dur-O-Wall D/A 431.

E. Bent Wire Ties: Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches wide.

2. Type for Masonry Where Coursing between Wythes Align: Unit ties bent from one piece of wire.

3. Type for Masonry Where Coursing Between Wythes Does Not Align: Adjustable ties composed of two parts, one with pintles, the other with eyes, maximum misalignment 1-l/4 inches.

F. Anchors for Connecting Masonry to Structural Steel: Two-piece assembly consisting of anchor and tie, designed to allow differential movement between wall and framework parallel to plane of wall, while resisting tension and compression forces perpendicular to the face of the wall.

1. Anchor: Crimped l/4-inch-diameter wire for welding to steel.
2. Wire Tie: Triangular shape, 0.1875 inch diameter galvanized steel wire, length sized to extend within 1 inch of masonry face.

G. Rigid Anchors: Provide straps of form and length indicated, fabricated from metal strips of 1-1/2 inches wide by 1/4 inch thick; unless other size is shown on drawings.

H. Post-Installed Anchors: Chemical or expansion anchors, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

1. Corrosion Protection: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).
2. Corrosion Protection: Stainless steel components complying with ASTM F 593 and ASTM F 594, Group 1 alloy 304 or 316 for bolts and nuts; alloy 304 or 316 for anchor.
3. For Postinstalled Anchors in Concrete: Capability to sustain, without failure, a load equal to 4 times the loads imposed by masonry.
4. For Postinstalled Anchors in Grouted Concrete Masonry Units: Capability to sustain, without failure, a load equal to 6 times the loads imposed by masonry.

2.07 EMBEDDED FLASHING MATERIALS

A. Copper-Fabric Laminate: Copper sheet 5 oz. per sq. ft., bonded with asphalt between 2 layers of glass fiber cloth. Furnish one of the following:

1. "Copper Fabric," Afco Products Inc.
2. "Type FCC-Fabric Covered Copper," Phoenix Building Products.
3. "Copper Fabric Flashing," Sandell Manufacturing Co., Inc.
4. "York Copper Fabric Flashing," York Manufacturing, Inc.

B. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, non-drying, nonmigrating sealant.

C. Adhesive for Membrane Flashings: Of type recommended by manufacturer of flashing material for use indicated.

D. Metal Drip Edge: Formed from ASTM B 370 16 ounce-weight cold-rolled copper, zinc coated both sides in accordance with ASTM BIOI; weight of lead coating 6 to 7.5 lbs./100 sq. ft. on each side of the sheet. Form on brakes to provide 1 inch long hemmed drip edge, with straight lines and clean, sharp bends.

2.08 MISCELLANEOUS MASONRY ACCESSORIES

A. Cavity Insulation: Extruded polystyrene thermal insulation; ASTM C 578, Type IV.

B. Nonmetallic Expansion Joint Strips: Premolded neoprene or polyvinylchloride filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of2-5 psi), compressible up to 35 percent.

C. Rope Wicking: Cotton rope, 1/4" to 3/8" diameter, and 8" to 10"

long. D. Peastone: Clean, rounded stone, 114" to 3/8" diameter.

2.09 MASONRY CLEANERS

A. Water for Cleaning: Potable.

B. Job-Mixed Detergent Solution: For each 5 gal. (20 L) of solution required, mix 2 cups (0.5 L)
Of tetrasodium polyphosphate (TSPP), 112 cup (125 mL) of laundry detergent, 5 quarts (5 L) of
5% sodium hypochlorite (bleach), and 15 quarts (15 L) of warm water.

C. Proprietary Chemical Cleaners for general cleaning of new masonry: Manufacturer's standard-
strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry or colored mortar surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned:.

1. Acceptable Manufacturers:
   a. ProSoCo, Inc.
   b. Diedrich Technologies, Inc.

2. For light-colored brick and concrete block masonry not subject to metallic oxidation stains, use formulation consisting of a concentrated blend of surface-acting acids, chelating, and wetting agents; ProSoCo "SureKlean No. 600 Detergent." or equal.

3. For dark colored brick and concrete block masonry not subject to

metallic oxidation stains, use formulation consisting of a liquid blend of surface-acting acids and special inhibitors; ProSoCo "SureKlean No. 101 Lime Solvent" or equal.

4. For light and dark colored masonry subject to metallic oxidation stains, use formulation consisting of a liquid blend of organic and inorganic acids and special inhibitors; equal to ProSoCo "SureKiean Vanatrol."

5. Approval of cleaner will not be final until completion of test cleaning specified in Part 3.

2.10 MORTAR AND GROUT MIXES

A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

2. If cold-weather admixture is used, add at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, using portland cement-lime mortar (not masonry mortar). For measuring sand, use a container Whose volume has been accurately determined; do not use shovel counts. Provide mortar types as follows unless higher strength mortar is indicated on the drawings:

1. For masonry below grade and in contact with earth, and for masonry retaining walls, use Type M.

2. For reinforced masonry above grade, interior and exterior or, use Type S.

3. For interior partitions which are non-loadbearing and not indicated to be reinforced, use type N.

4. For masonry veneer, use Type N mortar.

C. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Limit mineral oxide pigments to not more than 10% of cement content by weight:

D. Repointing Mortar: Match composition and color of the existing mortar.

E. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Grout for reinforced concrete masonry unit walls shall have a minimum 28 day compressive strength of2500 psi.

2. Use fine grout in grout spaces less than 2 inches (50 mm) in horizontal dimension, unless otherwise indicated.

3. Use coarse grout in grout spaces 2 inches (50 mm) or more in least horizontal dimension, unless otherwise indicated.

PART 3- EXECUTION

3.01 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry. Do not proceed until unsatisfactory conditions have been corrected.

B. Prior to the start of masonry construction, ascertain that the Contractor has verified that concrete foundations and footings have been constructed with tolerances conforming to the requirements of Section 03310, "Cast-in-Place Concrete" and that reinforcing dowels are positioned in accordance with the Structural Drawings, as required by Section 01450. If these conditions are not met, notify the Architect in writing; do not build upon incorrectly constructed foundations or dowels.

C. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.02 INSTALLATION, GENERAL

A. Thickness: Build masonry veneer walls construction to the full thickness shown.

B. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.

C. Match coursing and bonding of new masonry with existing masonry. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges

concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

F. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

1. To determine whether brick requires wetting, test rate of absorption as follows: Draw a circle the size of a quarter on a brick and place 20 drops of water in the circle. If the water is absorbed within 90 seconds, the brick requires wetting.

G. Keep air spaces in veneer and cavity walls free of mortar, so that the downward flow of water is not obstructed. Use methods of laying masonry that will minimize mortar droppings in this space. Below the courses being laid, place a strip of lumber in the air space that is as wide as the air space is deep, and periodically clean out the space by lifting the lumber strip; or use an equivalent method acceptable to the Architect for cleaning the air space.

H. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.

I. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.

J. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.

K. Built-In Work: As construction progresses, build-in anchors, inserts, sleeves, and similar items furnished under other sections of the Specifications. Fill in solidly with masonry around built- in items.

L. Fill air space cavity wall insulation wherever veneer wall is continuous between inside and outside ofthe building.

M. Coordination with Work of Other Trades: Build surrounding masonry closely around embedded items such as electrical conduit and electrical boxes which are installed by other trades.

N. Build control joints in concrete unit masonry and expansion joints in clay unit masonry. Specific requirements are given for each type of construction in this Section.

O. Build in horizontal pressure-relieving joints. Place compressible joint filler injoints; leave joint open to depth required to permit installation of sealant and backer rod, or firesafing and firestopping sealant, as indicated, and as specified in Division 7 Sections.

1. Masonry Veneer: Locate joints beneath shelf angles supporting masonry veneer and at other locations where indicated.

2. Nonbearing Interior Partitions: Build full height of story to underside of solid floor or roof structure above and provide pressure-relieving joint between top of partition and underside of structure above.

P. Pressed Metal Frames: Fill space between pressed/hollow metal frames and masonry solid with mortar.

3.03 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arrises, do not exceed 1/4 inch in 10 feet (6 mm in 3m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external comers, expansion joints, control joints, and other conspicuous lines, do not exceed 114 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12m) or more. For vertical alignment of head joints, do not exceed plus or minus 114 inch in 10 feet (6 mm in 3m), nor 112 inch (12 mm) maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 114 inch in 20 feet (6 mm in 6 m), nor 112 inch in 40 feet (12 mm in 12m) or more. For top surface of bearing walls, do not exceed 118 inch (3 mm) in 10 feet (3m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 112 inch in 20 feet (12 mm in 6 m), nor 3/4 inch in 40 feet (19 mm in 12m) or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 114 inch (6 mm) nor plus 1/2 inch (12 mm).

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 118 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus
114 inch (6 mm) or plus 3/8 inch (10 mm).

3.04 CONCRETE UNIT MASONRY WALLS

A. Bond Pattern and Jointing: Match existing. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

B. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells.
Bed webs in mortar where adjacent to cells that are to be filled with grout.

C. Vertical Reinforcing: Build in vertical reinforcing (if any) as work progresses as shown on drawings. Fully grout cells in which vertical reinforcing is placed.

D. Horizontal Joint Reinforcing: Build in horizontal joint reinforcing in every other course, 16- inches on center vertically, as work progresses. Provide additional reinforcing where shown on Drawings.

1. Provide a minimum of 5/8 inch mortar cover over side rods of horizontal joint reinforcing on exterior side of walls; 112 inch mortar cover at interior locations.

2. Lap adjacent lengths a minimum of 6 inches.

3. Install prefabricated "L" and "T" sections at corners and wall intersections.

4. At returns, offsets, pipe enclosures and other special conditions, cut and bend reinforcing to provide continuity.

E. Control Joints: Provide control joints at locations shown on drawings. Fit strip of compressible filler into control joint. Leave free of mortar to permit installation of backer rod and sealant, specified in Section 07900.

3.05 BRICK VENEER ON STEEL STUDS (EXTERIOR)

A. Bond Pattern: As shown on drawings. At corners and jambs, use units with at least nominal 4- inch horizontal face dimension.

B. Lay brick with full mortar coverage in bed and head joints. Lay block with full mortar coverage of face shells and webs.

C. Installing Masonry Ties: The following requirements apply to both exterior and interior masonry veneer, except as indicated.

1. Before beginning a section of work, install tie anchor sections. Fasten plates to studs with screws; use two screws per anchor, unless single-screw type is specified. Locate plates carefully so that screws are approximately centered in the stud flange and at least 1/2" from the edge of the metal.
   a. At exterior face of exterior walls, place a layer of gasket material behind each tie to make screw-holes watertight.

2. Install at least I anchor for each 2.67 sq. ft. (0.25 sq. m.) of wall area, and space anchors no farther apart than 18 inches (457 mm) vertically and 32 inches (813 mm) horizontally. Stagger alternate courses.

3. In exterior veneer, at re-entrant corners, for a distance of 10 feet from the corner and for the full height of masonry veneer, increase the number of ties to 1 per 1.88 sq. ft.

4. Install additional anchors around openings larger than 16 inches in either dimension; place such additional anchors within 12 inches (305 mm) of openings and space no farther apart than 36 inches (1000 mm) on center.

5. Build in adjustable pintle ties as work progresses. Place ties so they extend at least 1.5 inches into the masonry, with at least 5/8" of mortar cover at the exterior face of the wall.

D. Seismic Joint Reinforcing: Install continuous single-wire seismic joint reinforcement in horizontal joints of veneer wythe at maximum spacing of 18 inches on center, vertically.

E. Keep air space clean of mortar droppings and other materials during construction. Strike joints facing air spaces flush.

F. Jointing: 3/8" thick, unless shown otherwise on drawings. Tool joints slightly Concave.

G. Masonry Control Joints:

1. Location and Spacing: Location is shown on drawings. If not shown, construct expansion joints 30 feet on center, maximum spacing. Locate joints as recommended by BIA Technical Note 18A at locations approved by Architect.

2. Build in joint filler. Leave joint open for a depth of 112" to allow for installation of sealant and backer rod specified in Division 7 Section "Joint Sealers." Keep joint clear of mortar.

H. Seismic Isolation: Isolate the sides and top of anchored veneer from the structure so that the vertical and lateral seismic forces resisted by the structure are not imparted to the veneer wythe.

3.06 CONCRETE UNIT MASONRY (INTERIOR)

A. Bond Pattern: Lay in running bond, offset 1/2 unit between courses, unless otherwise shown. At corners and jambs, use units with at least nominal4-inch horizontal face dimension.

B. Lay masonry with full mortar coverage in bed and head joints. Bed webs in mortar in starting course on footings, and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Masonry Ties:

1. Before beginning a section of work, install tie anchor sections/backplates. Fasten plates to studs with screws; use two screws per anchor, unless single-screw type is specified. Locate plates carefully so that screws are approximately centered in the stud flange and at least l/2" from the edge of the metal.

2. Install at least 1 anchor for each 2.67 sq. ft. (0.25 sq. m.) of wall area, and space anchors no farther apart than 18 inches (457 mm) vertically and 32 inches (813 mm) horizontally. Stagger alternate courses.

3. Install additional anchors around openings larger than 16 inches in either dimension; place such additional anchors within 12 inches (305 mm) of openings and space no farther apart than 36 inches (1000 mm) on center.

4. Build in ties as work progresses. Place ties so they extend at least 1.5 inches into the masonry, with at least 5/8" of mortar cover at the exterior face of the wall.

D. Horizontal Joint Reinforcing: Build in horizontal joint reinforcing as work progresses.

1. Install seismic ladder type horizontal joint reinforcing in alternate courses. Install in coordination with the masonry ties and anchors, and lock the reinforcing into the shear lugs of the anchors.

2. Provide a minimum of 1/2 inch mortar cover on both sides of the reinforcing rod at interior locations.

3. Lap adjacent lengths a minimum of 6 inches.

4. Continue every other course of reinforcing (50%) across vertical control joints.

5. Cut or interrupt joint reinforcement at building expansion joints.

6. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections.

7. Provide continuity at returns, offsets, and other special conditions by cutting and bending reinforcing.

E. Seismic Isolation: Isolate the sides and top of anchored veneer from the structure so that the vertical and lateral seismic forces resisted by the structure are not imparted to the veneer wythe.

F. Jointing: 3/8" thick, unless shown otherwise on drawings. Tool joints of interior partitions as follows:

1. Standard Block (Unscored): Tool exposed joints slightly concave to consolidate the mortar and to shed water

2. Scored masonry: Rake joints to match profile of score.

3. Masonry concealed inside wall construction and above ceilings: Strike joints flush.

4. Finish joints in masonry which is concealed behind finishes (such as acoustical wall treatment and wood paneling), permanently installed casework, furniture, fixtures and

G. Keep air space clean of mortar droppings and other materials during construction. Strike joints facing air spaces flush.

H. Built-In Work: As construction progresses, build-in anchors, sleeves, and similar items furnished under other sections of the Specifications.

1. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

2. Fill cores in hollow concrete masonry units with grout 3 courses (24 inches) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Control Joints: Build control joints in concrete unit masonry at locations shown on drawings.

1. If control joint locations are not shown, comply with recommendations of NCMA TEK 10-2 for spacing and locations, placing control joints at specific locations approved by Architect. In general, provide control joints at changes in wall heights, at one or both sides of door openings, and at least one every 50 feet.

2. Form control joints in concrete masonry as follows: Fit strip of compressible filler into control joint. Leave free of mortar to permit installation of backer rod and sealant, specified in Section 07920.

3.07 LOOSE LINTELS

A. Lintels: Build in lintels as work progresses.

B. Steel lintels: Provide at least 8" bearing at each end of lintels. For openings wider than 8'-0", provide one additional inch of bearing each side for each foot or fraction thereof by which opening width exceeds 8'-0".

C. Provide masonry lintels wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling

and installation. Temporarily support formed-in-place lintels.

1. For hollow concrete masonry unit walls, use specially formed bond beam units with reinforcement bars placed as indicated and filled with coarse grout.

2. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

3.09 FLASHING AND WEEP HOLES

A. Install through-wall flashing and weeps in masonry at shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated.

B. Coordinate masonry work with the installation of sheet metal counterflashing specified in Section 07620. Prepare substrates and provide mortar below and above metal flashing which is built-into masonry. Do not cover metal flashing with masonry until the flashing has been made watertight with properly formed joints and end dams and similar details, under Section 07620.

C. Prepare substrates against which flashing is to be placed, so that they are smooth and free from projections that could puncture flashing. Provide support for flashing at gaps between ends of shelf angles by stripping with flashing embedded in mastic, or by other means acceptable to Architect.

1. Place a bed of mortar under metal and metal-laminate through-wall flashing, sloped to the outside face of the wall to drain water.

D. Install copper fabric flashing and metal drip edge as follows:

1. Install copper-fabric flashing in accordance with the flashing manufacturers' instruction for handling, shaping, supporting and sealing.

2. In masonry veneer walls, build inside edge of flashing in behind the sheathing.

3. End Dams: At lintels, shelf angles, heads and sills, extend flashing a minimum of 4 inches into masonry at each end, tum up ends at least 2 inches and fold to form an end dam. Wherever a length of flashing terminates at a vertical surface, such as a change in material, tum up ends at least 2 inches and fold to form an end dam. Pre-formed end dams of same material as flashing, may be used; seal such separate units watertight to the flashing.

4. Metal Drip Edge: Place drip edge in correct position relative to the face of the wall so that drip edge extends 112" in front of face ofwall and is angled approximately 30- 45 degrees away from the wall. Lap lower

edge of copper-laminate flashing over the metal and seal watertight to the metal with mastic, leaving the laminate flashing exposed temporarily. Lap and seal end-to-end joints of metal drip edge.

5. Seal laps and penetrations in flashing with mastic before covering with bedding mortar for the first course of masonry.

6. After wall construction has been completed, cut copper-laminate flashing 1/2 inch behind face of wall, leaving only the metal drip edge exposed.

E. Weeps: In the first course of masonry immediately above embedded flashing, provide weep holes in exterior wythe by inserting cotton rope wicks in every second head joint (16 inches/

406 mm on center). Extend weep at least 18 inches up into the wall and leave at least 2 inches exposed at exterior, to permit rope to be pulled after mortar has set.

F. Peastone: Above through-wall flashing, place pea gravel in the air space or wall cavity to a height at least as high as the first course, and not less than 2 inches, above the flashing embedded in the wall.

G. Install reglets and nailers for flashing and other related construction where shown to be built into masonry.

3.10 FIELD QUALITY CONTROL

A. The Owner's Testing Agency will perform the following testing. Retesting of materials which fail to meet specified requirements shall be done at the Contractor's expense.

B. Brick Tests: For each type and grade of brick indicated, units will be tested by qualified independent testing laboratory per ASTM C 67 except 5 bricks will be selected at random for each 100,000 units or fraction thereof installed.

C. Concrete Masonry Unit Tests: For each type, class, and grade of concrete masonry unit indicated, units will be tested by qualified independent testing laboratory for strength, absorption, and moisture content per ASTM C 140.

D. Mortar Composition: Mortar composition and properties will be evaluated per ASTM C 780. Tests will be performed for each 5000 sq. ft. of wall area or portion thereof.

E. Prism Tests: To evaluate consistency of materials and workmanship, masonry prisms will be tested per ASTM E 447, Method B, and as follows:

1. Prepare masonry prisms for testing for each type of wall construction.
2. Prepare one set of prisms for testing at 7 days and one set for testing at 28 days.

F. Evaluation of Quality Control Tests: If masonry is not in compliance with specified requirements, repair to Architect's satisfaction, or remove and rebuild. Pay for additional testing required to demonstrate compliance of repaired and rebuilt masonry.

3.11 REPAIRING, POINTING, AND CLEANING

A. Reparing, pointing, and cleaning specified in this Article applies to repair of existing masonry, as well as to repair of new masonry that is incorrectly installed or damaged prior to the time of Substantial Completion.

B. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units and in fresh mortar or grout, pointed to eliminate evidence of replacement.

C. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings, and adjacent construction to provide a neat, uniform appearance, prepared for application of sealants.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.

3. Clean the masonry using method approved after test cleaning.

4. Clean brick by means of bucket and brush hand-cleaning method described in BIA "Technical Note No. 20 Revised" using job-mixed detergent solution or proprietary acidic cleaner.

5. Clean concrete masonry by means of cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

E. Cleaning with Chemical Cleaners: If chemical cleaners are used:

1. Comply with manufacturer's instructions for protection, mixing, handling and cleaning.

2. Protect adjacent glass, metal and other non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape. Also place barriers and warning signs as required to protect passers-by, automobiles, plants and other innocent bystanders from splatters, over-spray, and wind-

blown chemicals.

3. Require laborers to wear protective clothing, as required by OSHA and as recommended by manufacturer of chemical cleaner.

4. Wet wall surfaces with water prior to application of cleaners, and remove cleaners by rinsing thoroughly with clear water promptly after cleaning has been effected.

F. Protect masonry work from damage and deterioration until time of Substantial Completion.

END OF SECTION 048100

SECTION 05 12 00

STRUCTURAL STEEL

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to work specified in this Section.

1.02 SUMMARY

A. This Section includes the following:

1. Structural steel.

B. Related Work Specified in Other Sections:

1. Section 01400, “Quality Requirements,” for independent testing agency procedures.
2. Section 05101, “Metal Fabrications” for steel lintels not attached to structural steel.
3. Section 09901, “Painting,” for field painting of structural steel.

1.03 SUBMITTALS

A. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).

1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
2. High-strength bolts (each type), including nuts and washers.
3. Anchor bolts.
4. Weld filler material.
5. Structural steel primer paint.

B. Shop Drawings: Submit shop drawings prepared under supervision of a registered professional Engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams. Shop drawings shall be prepared in accordance with applicable portions of AISC, "Specifications for the Design, Fabrication and Erection of Structural Steel Buildings".

1. The steel fabricator shall be responsible for the design adequacy of connections shown on the shop drawings.

2. Include details of cuts, connections, camber, holes, supports, anchors, member sizes, shop painting, clearances, and other pertinent data. Indicate welds by standard AWS symbols, and show size, length, and type of each weld.

3. Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorages to be installed as work of others sections.

4. Fabrication shall not commence prior to review of shop drawings.

C. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections, and shop painting. Include data on type(s) of tests conducted and test results.

1. Refer to Section 01400, "Quality Requirements," for general testing requirements.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions, latest edition, of following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges", with the exception of Section 4.2.1, and its "Commentary".

2. AISC "Specifications for Structural Steel Buildings" - Allowable Stress Design and Plastic Design" and its "Commentary".

3. AISC "Specifications for Architecturally Exposed Structural Steel".

4. AISC "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts" approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

5. American Welding Society (AWS) D1.1 "Structural Welding Code - Steel".

6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

7. ASTM A 123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.

8. American Hot Dip Galvanizers Association (AHDGA), "Inspection Manual for Hot Dip Galvanized Products".

9. Steel Structures Painting Council (SSPC). "Steel Structures Painting Manual, Volumes 1 and 2".

B. Fabricator Qualifications: Fabricator must have a minimum of 5 years successful experience in the fabrication of structural steel framing components similar, in nature, to those required for this project. In addition, the fabricator shall have a quality control program acceptable to the Engineer.

C. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure".

1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests within previous 12 months.

2. If re-certification of welders is required, retesting will be Contractor's responsibility.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to site at such intervals to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not to delay work.

C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.

D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.

B. Structural Steel Shapes, Plates and Bars: Structural Steel Shapes shall be ASTM A 992, Fy = 50 KSI. Plates and Bars shall be ASTM A36.

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B, FY = 46 KSI.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B; or ASTM A 501, Fy = 36 KSI.

E. Anchor Bolts: ASTM A 307, non-headed type unless otherwise indicated.

F. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.

1. Provide hexagonal heads and nuts for all connections.

G. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

H. Direct tension indicator shall be used with slip-critical type high strength bolts.

I. Electrodes for Welding: Comply with AWS Code.

1. Filler metal shall conform to ASTM A 233, E-70 Series or Grade SAW-2, as required.

2. For high-strength low-alloy steel, provide electrodes, welding rods and filler metals equal in strength and compatible in appearance with parent metal joined.

J. Structural Steel Primer Paint: Primer 1 shall be lead and chromate free, TNEMEC 10-1009 Gray, or equal primer which will meet or exceed in performance Fed. Spec. TT-P-86d Type I or II.

K. Non-Shrink Grout: Refer to Division 3.

L. Zinc for Galvanizing: ASTM B 6 as specified in ASTM A 123.

2.02 FABRICATION

A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

2. Form angles to shapes indicated, with straight lines, sharp angles, and smooth curves. Drill or punch holes. Finish edges smooth.

3. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs, and other defects.

4. Conceal fastenings where practicable. Punch or drill for temporary field connections and for attachment of work by other trades.

5. The Contractor shall be responsible for all errors of detailing fabrication, and for the correct fitting of structural members.

B. Connections shall be bolted, welded or both and shall conform to the American Institute of Steel Construction, "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings".

1. Connections shall be as follows, unless otherwise indicated on plans.
   a. Simple beams (non-composite) connections shall be for a capacity of the loads given in the A.I.S.C. Uniform Load Tables.
   b. Composite beams, with shear studs, connections shall be for a capacity of twice the loads given in the A.I.S.C. Uniform Load Tables.
   c. Beam moment connections shall be for the moment capacity of the beam.
   d. Column splices shall be for the moment capacity of the lighter/or top column.
   e. Other member connections shall be for the loads, forces, and moments indicated on the plans.
   f. Beam to tube/pipe column connections shall be thru-plate connections unless indicated otherwise.
   g. One-sided or other types of eccentric connections will not be permitted unless indicated or having A/E approval prior to submitting shop drawings.

2. Bolt field connections, except where welded connections or other connections are indicated.
   a. Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are indicated.

3. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts" (RCRBSJ).

4. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
   a. Assemble and weld built-up sections by methods which will produce true alignment of axes without warp.

5. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings.
   a. Provide threaded nuts welded to framing, and other specialty items as indicated to receive other work.
   b. Cut, drill, or punch holes perpendicular to metal surfaces.
   c. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete or mortar. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only.

   1. Do not paint surfaces which are to be welded or high-strength bolted with slip-critical type connections.
   2. Do not paint surfaces which are scheduled to receive sprayed-on fireproofing.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:
   1. Surface preparation for steel elements exposed to a normal interior environment, or concealed, shall be in accordance with SSPC-SP3 power tool cleaning (removal of loose rust, loose mil scale and loose paint to degree specified by power to chipping, descaling, sanding, wire brushing and grinding.

C. Painting: Shop painting of structural steel shall conform to the referenced requirements of the Steel Structures Painting Council. Furnish affidavit if requested, from an independent inspection laboratory agreed upon by A/E, that shop painting has been properly accomplished. Paint thickness may also be measured in field by A/E prior to finish coatings with a magnetic gauge in accordance with SSPC-PA2-73T. Should insufficient thickness be noted, an additional field coat of primer will be required by this section at no additional cost to the Owner.

   1. Shop painting for steel elements exposed to a normal interior environment, or concealed shall be Primer 1 as specified herein, dip or spray applied to a minimum 2.0 mil D.F.T.

2.04 GALVANIZING

A. Steel members, fabrications, and assemblies to be galvanized after fabrication, by hot dip process in accordance with ASTM A 123 or A 386, as applicable. Weight of zinc coating to conform to requirements specified under "Weight of Coating" in ASTM A 123 or ASTM A 386, as applicable.

B. Safeguard against steel embrittlement in conformance with ASTM A 143.

C. Safeguard against warpage or distortion of steel members to conform with ASTM A 384. Notify Architect/Engineer of potential warpage problems which may require modifications in design, before proceeding with steel fabrications.

D. Finish and uniformity of zinc coating and adherence of coating to conform with ASTM A 123, A 153, or A 386, as applicable.

E. Bolts, nuts, and washers, and iron and steel hardware components to be galvanized in accordance with ASTM A 153. Weight of zinc coating to conform to requirements specified under "Weight of Coating" in ASTM A 153. Nuts to be tapped after galvanizing to minimum diametrical amounts specified in ASTM A 563. Coat nuts with waterproof lubricant, clean and dry to touch. High strength bolts for structural steel joints to be galvanized in accordance with ASTM A 325.

PART 3 - EXECUTION

3.01 INSPECTION

A. Erector must examine areas and conditions under which structural steel work is to be installed, and notify Contractor in writing of conditions detrimental to proper and timely completion of work.

3.02 ERECTION

A. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds, and report discrepancies to Engineer. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been agreed upon with Engineer.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

C. Temporary Planking: Provide temporary planking and working platforms as necessary to effectively complete work.

D. Anchor Bolts: Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.

1. Furnish templates and other devices as necessary for presetting bolt and other anchors to accurate locations.

2. Refer to Division 3 of these specifications for anchor bolt installation requirements in concrete, and Division 4 for masonry installation.

E. Setting Bases and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.

1. Set loose and attached base plates and bearing plates for structural members on steel wedges or leveling nuts.

2. Base plates and bearing plates shall be shimmed to line and grade, ready to receive grouting. Shims shall consist of steel wedges of sufficient size to support the members. Grout holes shall be provided in plates where necessary.

F. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

G. Pack non-shrink grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

1. Installation of grout materials shall comply with manufacturer's instructions.

H. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust various members forming part of complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment. Driftpins may be used only to bring several parts together, they shall not be used to enlarge holes or in a manner to disport or damage the metal.

1. Level and plumb individual members of structure within specified AISC tolerances. Adjust and weld in final position all structural steel angles which support architectural finish material. Adjustments are to be made to the tolerances of the applied finish material.

2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

3. Splice members only where indicated and accepted on shop drawings.

4. During erection, field bolts which will be exposed to the weather shall be dipped in primer paint immediately before placing in the work.

5. Surfaces of joints for welded or high strength bolted connections shall comply with the cleanliness requirements for all joints, surfaces and contact surfaces within joints as specified in ASTM A 325.

6. High strength bolts shall be tightened by use of a direct tension indicating device in accordance with the A.I.S.C. "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts". When it is required to used the load indicator under the nut, a special nut face washer shall be fitted between the indicator and the nut.

7. High strength bolts in bearing type connections as noted on drawings may be tightened to snug tight connection only and need not use a direct tension indicating device.

I. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

J. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

1. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.

K. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to Architect. Finish gas-cut sections equal to a sheared appearance when permitted.

L. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide minimum dry film thickness of 2.0 mils.

M. Touch-Up Galvanized Surfaces: Repair damaged galvanized surfaces in accordance with ASTM A 780. Dry film thickness of applied repair materials to be not less than galvanized coating thickness required by ASTM A 123, A 153, or A 386, as applicable. Touch up prime-painted surfaces with same galvanized primer applied in shop. Clean damaged surfaces first to assure proper paint adhesion.

3.03 QUALITY CONTROL

A. Testing agency shall inspect bolted connections, welded connections, shear studs and to perform tests and prepare test reports.

1. Refer to Section 01400, "Quality Requirements," for testing requirement.

2. Testing agency shall conduct and interpret tests and state in each report whether test specimens comply with requirements, and specifically state any deviations therefrom.

3. Provide access for testing agency to places where structural steel work is being fabricated or produced so that required inspection and testing can be accomplished.

4. Where destructive tests are desired, the test specimens shall be prepared by the Contractor as directed by the A/E. Furnish free of charge any necessary materials and access to or handling of materials required to perform any materials tests.

5. Testing agency may inspect structural steel at plant before shipment; however, A/E reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

B. Correct deficiencies in structural steel work which inspections and laboratory test reports have indicated to be not in compliance with requirements. Perform additional tests, at Contractor's

expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.

C. Bolted Connections: Inspect or test in accordance with AISC specifications and "Specification for Structural Joints using ASTM A 325 or A 490 Bolts".

D. Welding: Inspect and test during fabrication of structural steel assemblies, as follows:

1. Verify welder certification and conduct inspections and tests as required. Record types and locations of defects found in work. Record work required and performed to correct deficiencies.

2. Perform visual inspection of all welds.

3. The inspection agency will test shop welds as follows:
   a. All welds: 100% visual.
   b. Moment connection full penetration welds: 20% ultrasonic conforming to ASTM E 164.
      1) If more than 10 percent of the welds are rejected then an additional 20 percent of the welds shall be tested. If 10 percent of these additional welds are found to be rejectable then an additional 20% of all full penetration welds will be tested. If 10 percent of this group is rejected then 100% of the welds will be tested.

4. The inspection agency will test field welds as follows:
   a. All welds: 100% visual.
   b. Moment connection full penetration welds: 100% ultrasonic conforming to ASTM E 164.

4. Reports by the inspection agency will contain, as a minimum, an adequate description of each weld tested, the identifying mark of the welder responsible for the weld, a critique of statement regarding the acceptability of the weld tested, as judged by current A.W.S. Standards.

END OF SECTION 05120

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SECTION 05 21 00
STEEL JOISTS

PART 1 - GENERAL

1.01 PROVISIONS INCLUDED

A. The general provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to work specified in this Section.

1.02 SUMMARY

A. This Section includes the following:

1. K Series steel joists.

2. K Series steel joist substitutes

3. Joist accessories.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI Specifications.

1. If joist manufacturer is not a member of the SJI, he shall submit the following:
   a. Complete engineering design computations for the joists to be furnished.
   b. Load test data for review on joists designated on the drawings.
   c. Certified results of the design verification tests required in the joist SJI Standards.

B. Shop Drawings: Submit detailed drawings showing layout of joist units, special connections, joining, sloped bearings, shop painting and accessories. Include mark, number, type, location and spacing of joists and bridging.

1. Provide templates or location drawings for installation of anchor bolts and metal bearing plates.

2. Provide design load diagrams for all special (SP) joists indicated on Contract Drawings.

1.04 QUALITY ASSURANCE

A. Provide joists fabricated in compliance with the following, and as herein specified.

1. Steel Joist Institute (SJI) "Standard Specifications, Load Tables and Weight Tables" for:
   a. K-Series Steel Joists

2. Loading diagrams and profiles sketches shown on drawings.

B. Qualification of Field Welding: Qualify welding processes and welding operators in accordance with American Welding Society "Standard Qualification Procedure".

C. Inspection: Joists welded in place are subject to inspection and testing. Expense of removing and replacing any portion of steel joists for testing purposes shall be borne by Owner if welds are found to be satisfactory. Work found to be defective will be removed and replaced with new acceptable work, at the expense of the Contractor.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle steel joists as recommended in SJI Specifications. Handle and store joists in a manner to avoid deforming members and to avoid excessive stresses.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Steel: Comply with SJI Specifications.

B. High-Strength Threaded Fasteners: ASTM A 325 or A 490 heavy hexagon structural bolts with nuts and hardened washers.

C. Primer shall be manufacturer's standard in accordance with SSPC Paint Specification No. 15, Type 1 alkyd iron oxide primer.

2.02 FABRICATION

A. General: Fabricate steel joists in accordance with SJI Specifications. Steel joists shall be as manufactured by Nicholas J. Boras, Inc., Vulcraft, or Canam Steel Corporation.

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.

C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI Specifications and load tables.

D. Extended Bottom Chord: Extend bottom chord of joist at column locations and provide connection as required by manufacturer.

E. Ceiling Extensions: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either an extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2" of finished wall surface unless otherwise indicated.

F. Bridging: Provide horizontal or diagonal type bridging for joists and joist girders, complying with SJI Specifications.

1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

G. End Anchorage: Provide end anchorages including bearing plates, to secure joists to adjacent construction, complying with SJI Specifications, unless otherwise indicated.

H. Where joists slope greater than 1/4" per foot, provide sloped bearing.

I. Shop Painting: Remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories before application of shop paint. Apply one shop coat of primer paint to steel joists and accessories, by spray, dipping, or other method to provide a continuous dry paint film thickness of not less than 0.50 mil.

PART 3 - EXECUTION

3.01 INSPECTION

A. Erector must examine areas and conditions under which steel joists are to be installed and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Erector.

3.02 ERECTION

A. Place and secure steel joists in accordance with SJI Specifications, final shop drawings, and as herein specified.

B. Anchors: Furnish anchor bolts, bearing plates, and other devices to be built into concrete and masonry construction.

1. Provide unfinished threaded fasteners for anchor bolts, unless otherwise indicated.

C. Placing Joists: Do not start placement of steel joists until supporting work is in place and secured. Place joists on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

D. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.

1. Where "open web" joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

E. Bridging: Install bridging simultaneously with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

F. Fastening Joists:

1. Field weld joists to supporting steel framework in accordance with SJI Specifications for type of joists used. Coordinate welding sequence and procedure with placing of joists.

2. Bolt joists to supporting steel framework in accordance with SJI Specifications for type of joists used.

a. Provide high-strength threaded fasteners for bolted connections of steel joists to steel columns, and at other locations where shown, installed in accordance with AISC Specifications for "Structural Joints" using ASTM A 325 or A 490 Bolts.

G. Touch-Up Painting: After joist installation, paint field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and clean with solvent before painting. Use same type of paint as used for shop painting.

END OF SECTION 052100

SECTION 053100

STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Roof deck.
2. Noncomposite form deck.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for concrete fill.
2. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

a. .

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product Certificates: For each type of steel deck, signed by product manufacturer.

D. Welding certificates.

E. Field quality-control test and inspection reports.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

G. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Source Limitations for Electrified Cellular Floor Deck: Obtain cellular floor-deck units and compatible electrical components, such as preset inserts, activation kits, afterset inserts, service fittings, header ducts, and trench header ducts, from same manufacturer.

C. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those 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 of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

F. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

G. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than **25**percent.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 Section Roofing" to ensure protection of insulation strips against damage from effects of weather and other causes.

B. Coordinate layout and installation of trench headers, preset inserts, duct fittings, and other components specified in Division 26 Section "Underfloor Raceways for Electrical Systems" with installation of electrified cellular metal floor deck.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck:

a. ASC Profiles, Inc.
b. Canam Steel Corp.;The Canam Manac Group.
c. Consolidated Systems, Inc.
d. DACS, Inc.
e. D-Mac Industries Inc.
f. Epic Metals Corporation.
g. Marlyn Steel Decks, Inc.
h. New Millennium Building Systems, LLC.
i. Nucor Corp.; Vulcraft Division.
j. Roof Deck, Inc.
k. United Steel Deck, Inc.
l. Valley Joist; Division of EBSCO Industries, Inc.
m. Verco Manufacturing Co.
n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.
o.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade **G60 (Z180** zinc coating.

2. Deck Profile: As indicated Select one profile depth from subparagraph below or revise to suit Project. Indicate locations on Drawings if various depths are required. FMG approval, if required, is limited to roof deck 1-1/2 inches (38 mm) deep.
3. Profile Depth: **As** indicated
4. Design Uncoated-Steel Thickness: 0.0747 inch
5. Span Condition: Triple span or more.
6. Side Laps**:** Overlapped or interlocking seam at Contractor's option.

2.3 NONCOMPOSITE FORM DECK

A. Noncomposite Steel Form Deck: Fabricate ribbed-steel sheet noncomposite form-deck panels to comply with "SDI Specifications and Commentary for Noncomposite Steel Form Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), G90 zinc coating.

2. Profile Depth: 9/16 inch Select one steel thickness from subparagraph below or revise to suit Project.
3. Span Condition: Triple span or more.
4. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi , not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

J. Galvanizing Repair Paint: [ASTM A 780] [SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight].

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 3/4 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches (305 mm) apart in the field of roof

and 6 inches (150 mm) apart in roof corners and perimeter, based on roof-area definitions in FMG Loss Prevention Data Sheet 1-28.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches , and as follows:
   1. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

   1. End Joints: Lapped 2 inches minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and weld flanges to top of deck. Space welds not more than 12 inches apart with at least one weld at each corner.

   1. Install reinforcing channels or zees in ribs to span between supports and weld.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

   1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

   1. Weld Diameter: 3/4 inch, nominal.
   2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (910 mm), and as follows:
   1. Fasten with a minimum of 1-1/2-inch long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

   1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 09 Section Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

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SECTION 055113

METAL PAN STAIRS

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. Preassembled steel stairs with concrete-filled treads.
2. Steel tube railings attached to metal stairs.
3. Steel tube handrails attached to walls adjacent to metal stairs.
4. Wire mesh for stair guards.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for concrete fill for stair treads and platforms.
2. Section 055213 "Pipe and Tube Railings" for pipe and tube railings.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so that they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

1.4 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Prefilled metal-pan-stair treads.
2. Nonslip aggregates and nonslip-aggregate finishes.

3. Abrasive nosings.
4. Paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type and finish of nosing and tread.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. Alfab, Inc.
2. American Stair, Inc.
3. Lapeyre Stair Inc.
4. Worthington Metal Fabricators.

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance of Stairs: Metal stairs shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft..
2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch, whichever is less.

B. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. applied in any direction.
b. Concentrated load of 200 lbf applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
b. Infill load and other loads need not be assumed to act concurrently.

C. Seismic Performance of Stairs: Metal stairs shall withstand the effects of earthquake motions determined according to [ASCE/SEI 7] <Insert requirement>.

1. Component Importance Factor: 1.5.

2.3 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.

D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, Grade 25, unless another grade is required by design loads; exposed.

F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, Grade 30, unless another grade is required by design loads.

G. Woven-Wire Mesh: Intermediate-crimp, square pattern, 1 1/2-inch woven-wire mesh, made from 0.135-inch nominal diameter wire complying with ASTM A 510.

H. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

I. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

J. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).

K. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).

L. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.4 ABRASIVE NOSINGS N.A.

2.5 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.

2.6 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099000 "Painting"

B. 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.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

E. Welded Wire Reinforcement: ASTM A 185/A 185M, 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. 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 bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for [**Type 3 welds: partially dressed weld with spatter removed**] [**Type 4 welds: good quality, uniform undressed weld with minimal splatter**].

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.

2.8 STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," Commercial Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Fabricate stringers of steel plates or channels.

   a. Provide closures for exposed ends of channel stringers.

2. Construct platforms of steel plate or channel headers and miscellaneous framing members as needed to comply with performance requirements.
3. Weld stringers to headers; weld framing members to stringers and headers.
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.

1. Steel Sheet: Uncoated cold-rolled steel sheet.
2. Directly weld metal pans to stringers; locate welds on top of subtreads where they are concealed by concrete fill. Do not weld risers to stringers.
3. Shape metal pans to include nosing integral with riser.
4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.9 STAIR RAILINGS

A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: 1-1/4-inch- diameter top and 1 inch bottom rails and 1-1/4-inch-diameter posts.
2. Mesh Infill: Woven wire mesh crimped into 1-by-3/4-by-1/8-inch steel channel frames. Orient wire mesh with wires perpendicular and parallel to top rail.

B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint as shown in NAAMM AMP 521.

C. Form changes in direction of railings as follows:

1. As detailed.
2. By inserting prefabricated flush-elbow fittings.

D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.

G. Connect posts to stair framing by direct welding unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.

1. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
2. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.10 FINISHES

A. Finish metal stairs after assembly.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

3.2 INSTALLING RAILINGS

A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:

1. Anchor posts to steel by welding or bolting to steel supporting members.
2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as required to comply with performance requirements. as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with 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.

END OF SECTION 055113

SECTION 06 10 00

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 SUMMARY

A. Section Includes:

1. Framing with dimension lumber at openings in metal framing.
2. Wood blocking, cants and nailers.
3. Plywood backing panels.
4. Summary of Work
    1) Framing with dimension lumber at metal framing locations to reinforce door jambs and heads.
    2) Wood blocking and nailers in metal framed walls.
    3) Installation of metal angles at half-wall ends.
5. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

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 D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Preservative-treated wood.
2. Fire-retardant-treated wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.
6. Metal framing anchors.

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 lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber 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, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded 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. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

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 MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or 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 items indicated on Drawings, and the following:
1. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
2. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
3. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.

B. For items of dimension lumber size, provide No. 2 grade lumber and any of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Hem-fir; WCLIB or WWPA.
4. Western woods; WCLIB or WWPA.
5. Northern species; NLGA.
6. Eastern softwoods; NeLMA.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking,and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Do not splice structural members between supports unless otherwise indicated.

D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

E. Sort and select lumber so that natural characteristics will 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. Securely attach carpentry work to substrate by anchoring and 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.

H. 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.

3.2 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 miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

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SECTION 061600

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 SUMMARY

A. Section Includes:

1. Wall sheathing
2. Roof sheathing.
3. Sheathing joint and penetration treatment.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 072700 "Air Barriers" for water-resistive barrier applied over wall sheathing.

1.3 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.

1.4 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. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation; GlasRoc.
b. G-P Gypsum Corporation; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond e(2)XP.
d. Temple-Inland Inc.; GreenGlass
e. United States Gypsum Co.; Securock.

2. Type and Thickness: Type X, 5/8 inch thick.
3. Size: 48 by 96 inches for vertical installation.

2.3 ROOF SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation; GlasRoc.
b. G-P Gypsum Corporation; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond e(2)XP.

d. Temple-Inland Inc.; GreenGlass
e. United States Gypsum Co.; Securock.

2. Type and Thickness: Type X, 5/8 inch thick.
3. Size: 48 by 96 inches for vertical installation.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. 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.

2.5 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 079200 "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. Coordinate wall and roof 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.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. 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 wood framing with screws.
2. Fasten gypsum sheathing to cold-formed metal framing with screws.
3. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
4. 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.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

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.
2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners 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 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.1 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Section.

1.2 SUMMARY

A. Section includes finish carpentry items furnished and installed:
   1. Providing and installing interior wood shelving and built in counters and associated trim and caps at various locations noted in the drawings.
   2. Installation of Cabinetry.

B. Section includes finish carpentry items furnished under other sections and installed under this section:
   1. Flush Wood Doors

C. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

D. RELATED SECTIONS
   1. Section 06 10 00 – Rough Carpentry
   2. Section 07 90 00 – Joint Protection
   3. Section 08 14 16 – Flush Wood Doors
   4. Section 09 90 00 – Painting

1.3 REFERENCES

A. American National Standards Institute:
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. APA-The Engineered Wood Association:
   1. APA/EWA PS 1 - Voluntary Product Standard for Construction and Industrial Plywood.

C. American Society for Testing and Materials:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. Architectural Woodwork Institute:
   1. AWI - Quality Standards Illustrated, 8th edition

E. American Wood-Preservers' Association:
   1. AWPA C1 - All Timber Products - Preservative Treatment by Pressure Process.

F. Federal Specification Unit:
   1. FS A-A-1936 - Adhesive, Contact, Neoprene Rubber.

G. Hardwood Plywood and Veneer Association:
   1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood.

H. National Institute of Standards and Technology:
   1. NIST PS 20 - American Softwood Lumber Standard.

1.4 SUBMITTALS

A. Section 01 30 00 – Submittal Procedures.

B. Section 01 60 00 – Substitution Procedures

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, and grain direction, to minimum scale of 3" inch to 1 ft.

D. Product Data:
   1. Submit data on fire retardant treatment materials and application instructions.
   2. Submit data on attachment hardware, finish hardware, and prefinish materials.

E. Samples:
   1. Submit two samples of finish plywood, 8 x 10 inch in size illustrating wood grain and specified finish.
   2. Submit two samples of wood trim 10 inch long.
   3. Submit two samples of laminates, synthetic surfacing, hardware items, shop finishes.

F. Certification: Submit copy of fabricator's authorization to use AWI Grade Stamps.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with AWI (Architectural Woodwork Institute - Architectural Woodwork Quality Standards Illustrated, Premium Grade for clear or transparent finished fabrications and custom grade for painted fabrications.

1.6 QUALIFICATIONS

A. Fabricator: Company specializing in fabricating Products specified in this section with minimum three years documented experience.

1.7 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.8 SEQUENCING

A. Sequence work to ensure utility connections are achieved in orderly and expeditious manner.

1.9 COORDINATION

A. Section 01300 – Coordination and Meetings: Coordination and project conditions.

B. Coordinate work with electrical rough-in and installation of associated and adjacent components, and specified ecclesiastical equipment.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Softwood Lumber: AWI Grade I; maximum moisture content of 6-8 percent; and the following:
   1. Species of Wood: Eastern white pine.
   2. Cut or Slicing of Wood: Plain sawn.
   3. Matching of Individual Leaves to Each Other; random matching.

B. Hardwood Lumber: AWI Grade 1; maximum moisture content of 6-8 percent; and the following:
   1. Species of Wood: Maple
   2. Cut or Slicing of Wood: Plain Sawn.
   3. Matching of Individual Leaves to Each Other: random matching.

C. Hardwood Plywood: AWI Grade AA veneer with veneer core; type of glue recommended for application; and the following:
   1. Species of Veneer: Maple.
   2. Cut or Slicing of Veneer: rift sliced
   3. Matching of Individual Leaves to Each Other: random matching.
   4. Matching Across Panel Face: center balanced matching.
   5. Matching or Relationship of Panels to Each Other: pre-manufactured sets matching

D. Sheet Metal Components: Stainless steel, Type 304 with #4 satin finish; 1/16 inch thick.

2.2 ACCESSORIES

A. Fasteners: Of size and type to suit application; painted finish in concealed locations and satin stainless finish in exposed locations.

B. Concealed Joint Fasteners: Threaded steel.

C. Lumber for Shimming, Blocking, and Furring: Softwood lumber of pine species.

D. Wood Edge Trim: wood bullnose to match species, graining and coloration.

E. Wood Filler: Oil base, tinted to match surface finish color.

F. Wood Treatment:

1. Fire Retardant (FR-S Type): Chemically treated and pressure impregnated; capable of providing maximum flame spread/smoke development rating of 0-25 / <450 in accordance with ASTM E84.
2. Wood Preservative by Pressure Treatment (PT Type): AWPA Treatment C1 using water borne chromated Copper Arsenate (CCA) preservative with 0.25 lbs/cu ft retention.
3. Water Repellant Preservative Treatment by Dipping Method: WDMA I.S.4, with 0.25 cubic lbs/in/ft of chromated copper arsenate.
4. Wood Preservative (Surface Application): Clear at exposed framing locations, colored at concealed framing locations, Cuprinol water reducible type, manufactured by Sherwin Williams.
5. Shop pressure treat wood materials requiring fire rating to concealed wood blocking.
6. Provide identification on fire retardant treated material.
7. Deliver fire retardant treated materials cut to required sizes. Minimize field cutting.
8. Redry wood after pressure treatment to maximum percent moisture content.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 013000 - Submittals: Coordination and project conditions.

B. Verify adequacy of backing and support framing.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Install work in accordance with AWI Premium quality standard.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. Install components with screws at 12 inch on center.

E. Site Applied Wood Treatment:
1. Apply preservative treatment.

2. Brush apply two coats of preservative treatment on wood in contact with cementitious materials and roofing and related metal flashings. Treat site-sawn cuts.
3. Allow preservative to dry prior to erecting members.

F. Preparation For Site Finishing:
1. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
2. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.3 ERECTION TOLERANCES

A. Section 01 40 00 - Quality Control: Tolerances.

B. Maximum Variation from Indicated Position: 1/16 inch.

C. Maximum Offset from Alignment with Abutting Materials: 1/32.

3.4 SCHEDULES

A. Interior: See finish schedule and drawings.

END OF SECTION

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BUILDING INSULATION

SECTION 07 21 00

PART 1 GENERAL

1.1 SUMMARY

A. Section includes batt thermal insulation installed in wall assembly.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

1.2 RELATED SECTIONS

Division 1		– General Requirements, all Sections
Section	06 10 53	– Miscellaneous Rough Carpentry
Section	07 26 00	– Vapor Barrier
Section	07 27 00	– Air Barrier
Section	07 90 00	– Joint Protection
Section	09 29 00	- Gypsum Board
Section	23 00 00	- Mechanical
Section	26 00 00	- Electrical

1.3 REFERENCES

A. ASTM International:
1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

A. System performance to provide continuity of thermal barrier at building enclosure elements in conjunction with vapor retarder materials in Section 07 26 00 and air barrier materials in Sections 07 27 00.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data including thermal performance of materials.

PART 2 PRODUCTS

2.1 BUILDING INSULATION

A. Manufacturers:

1. Certain Teed - Glass Fiber Insulation Model: CertaPro.
2. Johns Manville, Insulation Group - Glass Fiber Insulation Model: ComfortTherm.
3. Owens-Corning Fiberglas - Glass Fiber Insulation Model: Thermal Batt Fiberglas Insulation.
4. Substitutions: Not Permitted.

2.2 COMPONENTS

A. Batt Insulation: ASTM C665, preformed glass fiber batt , flange attachment manufactured by, conforming to the following:
1. Thermal Resistance: as indicated in Schedule or on Drawings.
2. Facing: Faced on one side with asphalt treated mesh reinforced Foil.
3. Flame/Smoke Properties: in accordance with ASTM E84.

2.3 ACCESSORIES

A. Adhesive: Type recommended by insulation manufacturer for application manufactured by.

B. Air Barrier: As specified in Section 07 27 00.

C. Sheet Vapor Retarder: As specified in Section 07 26 00.

D. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

3.2 INSTALLATION

A. Batt Insulation:
1. Install in new floor when framing is exposed during construction, or as indicated on drawings, without gaps or voids.
2. Fit insulation tight in spaces. Leave no gaps or voids.
3. Install with factory applied membrane facing warm side of building spaces. Attach flanges of facing to framing members.
4. Place vapor retarder in accordance with Section 072600.

3.3 SCHEDULES

A. Floor Insulation: R-30 roll, faced; separate 6 mil vapor retarder.

END OF SECTION

ACOUSTIC INSULATION

SECTION 07 21 13

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Batt sound attenuation installed at demising walls as indicated on the drawings.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

1.2

Division	1	–	General Requirements, all Sections
Section	06 10 00	–	Rough Carpentry
Section	07 90 00	–	Joint Protection
Section	09 22 16	-	Non Structural Metal Framing
Section	09 29 00	-	Gypsum Board

1.3 REFERENCES

A. ASTM International:
1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.4 SYSTEM DESCRIPTION

A. Batt sound attenuation insulation installed in partition construction system.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data including thermal performance of materials.

PART 2 PRODUCTS

2.1 OMPONENTS

A. Mineral-Wool Blanket, Unfaced A 1.0, A1.2 & A 3.0: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Industrial Insulation Group, LLC (IIG-LLC).

b. Roxul Inc.
c. Thermafiber, Inc.; an Owens Corning company.

2.2 ACCESSORIES

A. Adhesive: Type recommended by insulation manufacturer for application manufactured by.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

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. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. 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. 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.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1) Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

3.4 SCHEDULES

A. Wall Insulation:
1. Acoustic sound deadening – unfaced batt mineral fiber insulation

B. Ceiling Insulation:
1. Acoustic sound deadening – unfaced batt mineral fiber insulation

END OF SECTION

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SECTION 07 21 14

BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes rigid and semi-rigid board insulation and integral vapor retarder at cavity wall construction, perimeter foundation wall, underside of floor slab, exterior wall, and roof construction.

B. **Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.**

C. Related Sections:
1. Section 04 26 13 – Masonry Veneer
2. Section 07 26 00 – Vapor Retarders: vapor retarder materials to adjacent insulation.
3. Section 07 27 00 – Air Barriers: air seal materials to adjacent insulation.
4. Section 07 42 13 – Metal Wall Panels: board insulation behind metal wall cladding.
5. Section 07 53 05 – Elastomeric Membrane Roofing: rigid insulation at roof system.
6. Section 09 29 00 – Gypsum Board

1.2 REFERENCES

A. ASTM International:
1. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.
2. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation.
3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
4. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
5. ASTM C1289 - Standard Specification for Faced Rigid Cellular Thermal Insulation Board.
6. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
7. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
8. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. National Fire Protection Association:
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

C. Underwriters Laboratories Inc.:
   1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Materials of This Section: Provide continuity of thermal barrier at building enclosure elements in conjunction with thermal insulating materials in Section.

B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07 26 00.

C. Materials of This Section: Provide thermal protection to air seal materials at building enclosure elements in conjunction with air barrier materials in Section 07 27 00.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit data on product characteristics, performance criteria, limitations, adhesives, and.

C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation, installation techniques, and.

D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

1.6 SEQUENCING

A. Section 01 10 00 - Summary: Work sequence.

B. Sequence Work to ensure fireproofing, firestopping, vapor retarder, and air barrier materials are in place before beginning Work of this section.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with Section 07 26 00 for installation of vapor retarder and Section 07 27 00 for air seal materials.

PART 2 PRODUCTS

2.1 BOARD INSULATION

A. Manufacturers:
   1. UC Industries/Owens Corning - Extruded-Polystyrene Insulation Model Foamular CW 25 at walls, Foamular 250 at foundations and slabs shall be the basis for "or equal" product properties and performance.
   2. Dow Chemical - Extruded-Polystyrene Insulation
      Tenneco Foam Products - Extruded-Polystyrene Insulation .
   3. Substitutions: Section 01 60 00 - Product Requirements .

2.2 COMPONENTS

A. Extruded Polystyrene Insulation: ASTM C578 Type IV; cellular type, conforming to the following:
   1. Board Density: 1.44 – 1.56 lb/cu ft.
   2. Board Size: 16x96 inch.
   3. Board Thickness: 3 inches at walls, 2 inch at foundations and slabs.
   4. Thermal Resistance: minimum R value of 15 at walls, minimum R value of 10 at foundations and slabs and average of R-25 at roof.
   5. Water Absorption: In accordance with ASTM D2842 0.3 percent by volume maximum.
   6. Compressive Strength: Minimum 25 psi.
   7. Board Edges: Square edges.
   8. Flame/Smoke Properties: 5/175 in accordance with ASTM E84 , labeled by agency acceptable to authorities having jurisdictions.

B. Tapered Polyisocyanurate Insulation: ASTM C1289, rigid board, conforming to the following:
   1. Board Density: 1.44 – 1.56 lb/cu ft .
   2. Board Size: 16x96 inch .
   3. Board Thickness: average of 5 inches.
   4. Facing: Unfaced.
   5. Compressive Strength: Minimum 25 psi.
   6. Thermal Resistance: Aged R of 5.
   7. Board Edges: square.
   8. Water Absorption: In accordance with ASTM D2842 less than .3 percent by volume maximum.
   9. Flame/Smoke Properties: 5/175 in accordance with ASTM E84.

2.3 ACCESSORIES

A. Adhesive Type 1: Type recommended by insulation manufacturer for application of insulation. Fasteners: Impaling clip of galvanized steel with washer retainer and clips, to be adhered to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

C. Verify substrate surface is flat, free of honeycomb, fins, irregularities, materials or substances affecting adhesive bond.

3.2 INSTALLATION - FOUNDATION PERIMETER

A. Adhere 4 inch wide strip of polyethylene sheet over construction joints with double beads of adhesive each side of joint.
   1. Tape seal joints.
   2. Extend sheet full height of joint.

B. Apply adhesive in three continuous beads per board length to full bed 1/8 inch thick.

C. Install boards on foundation wall perimeter, vertically.
   1. Place boards in method to maximize contact bedding.
   2. Stagger side end joints.
   3. Butt edges and ends tight to adjacent board and to protrusions.

D. Extend boards over control joints, unbonded to foundation 4 inches on one side of joint.

E. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

3.3 INSTALLATION - CAVITY WALLS & ROOF

A. Secure impale fasteners to substrate at frequency of 6 per insulation board.

B. Adhere 4 inch wide strip of polyethylene sheet over control joint with double beads of adhesive each side of joint between sheets. Extend sheet full height of joint.

C. Apply adhesive in three continuous beads per board length to full bed 1/8 inch thick on substrate. Daub adhesive tight to protrusions to ensure continuity of vapor retarder and air seal.

D. Install boards horizontally between wall reinforcement.

E. Place membrane surface facing out, butter with adhesive tape seal board joints.

F. Place boards in method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and no protrusions. Place impale fastener locking discs.

G. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

H. Place 4 inch wide polyethylene sheet at perimeter of wall openings, from adhesive vapor retarder bed to window, door, frames. Tape seal in place to ensure continuity of vapor retarder and air seal.

3.4 INSTALLATION - UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

D. Tape seal board joints, cuts and tears in insulation facing.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 70 00 - Execution Requirements: Protecting installed construction.

B. Do not permit damage to insulation prior to covering.

END OF SECTION

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SECTION 07 26 00

VAPOR RETARDERS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes sheet and sealant materials for controlling vapor diffusion at slabs; materials to continue vapor retarder from wall to roof construction; and materials to continue vapor retarder from wall to window and door.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Related Sections:

Section	06 10 53	– Miscellaneous Rough Carpentry
Section	07 27 00	– Air Barriers
Section	07 90 00	– Joint Protection
Section	09 29 00	– Gypsum Board
Section	26 00 00	– Electrical

1.2 SYSTEM DESCRIPTION

A. Materials and installation methods to provide continuity of vapor retarder:
1. In conjunction with materials described in Section 07 27 00, and 07 90 00.

2. To seal gaps between enclosure components and opening frames.

1.3 REFERENCES

1. ASTM International:ASTM D 882 - Tensile Properties of Thin Plastic Sheeting.
2. ASTM D 1709 - Impact Resistance of Plastic Film by the Free-Falling Dart Method.
3. ASTM D 2582 - Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
4. ASTM D 3776 - Mass per Unit Area (Weight) of Woven Fabric.
5. ASTM D 4833 - Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
6. ASTM E 96 - Water Vapor Transmission of Materials.
7. ASTM E 1643 - Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
8. ASTM E 1745 - Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
9. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

B. Sealant, Waterproofing and Restoration Institute:
1. SWRI - Sealant Specification.

1.4 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Section 01 60 00 – Product Requirements: Product Substitution Procedures

C. Product Data: Submit manufacturer's product data including performance of vapor retarder.

D. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

1.5 SEQUENCING

A. Section 01 10 00 - Summary: Work sequence.

B. Sequence Work to permit installation of materials in conjunction with other retardant materials and seals, and air barrier assemblies specified in Section 07 27 00.

C. Do not install vapor retarder until items penetrating vapor retarder are in place.

PART 2 PRODUCTS

2.1 VAPOR RETARDERS (See Architectural Drawings for location where used as vapor/air barrier)

A. Manufacturers:
1. Fiberweb Corp.
2. Griffolyn, Reef Industries
3. Lamtec Corp.
4. Raven Industries
5. Substitutions: Permitted per Section 01 60 00, Substitution Procedures.

2.2 COMPONENTS

A. Reinforced Vapor Retarder: (Gryffolyn as design standard)
1. Material: 3-ply laminate, combining 2 layers of high-density polyethylene and 1 high-strength non-woven cord grid.
2. Weight, ASTM D 3776: 37 lb/1,000 ft^2 (18.1 kg/100 m^2).
3. Puncture Propagation Tear, ASTM D 2582: 28 lb (124 N).
4. Permeance (Perm), ASTM E 96: 0.038 grains/hr-ft^2-in Hg (2.18 ng/(Pa-s-m^2)).
5. Drop Dart, ASTM D 1709 Method B: 500 g.
6. Tensile Strength, 3 Inches, ASTM D 882: 96 lb/5,442 psi (427 N/37,522 kPa).
7. Puncture Strength, ASTM D 4833: 24 lb (106 N).
8. Classification, ASTM E 1745: Class C.
9. Usable Temperature Range: -25 to 170 degrees F (-32 to 77 degrees C).

2.3 ACCESSORIES

A. Butyl Sealant: ASTM C920, butyl rubber base, single component, solvent release, non-skinning, black color.
1. Elongation Capability: 5 percent.

2. Service Temperature Range: -40 to 180 degrees F.
3. Shore A Hardness Range: 10 to 30.

B. Primer and Backer Rods: Recommended by sealant manufacturer to suit application.

C. Cleaner: Non-corrosive type; recommended by sealant manufacturer; compatible with joint forming materials.

D. Mastic Adhesive: Asphalt type; compatible with sheet barrier and substrate; thick mastic of uniform consistency.

E. Tape: Polyethylene self-adhering type; mesh reinforced; 2 inch wide, compatible with sheet material.

F. Attachments: Galvanized steel staples and/or roofing nails bars and anchors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate materials are dry and clean. Remove loose or foreign matter impairing adhesion.

3.2 PREPARATION

A. Coordinate with Work of other affected sections.

B. Clean and prime substrate surfaces to receive adhesive and sealants.

3.3 INSTALLATION

A. Install sheet retarder prior to pouring slab on grade in crawlspace. Lay sheets in most efficient configuration. Tape all joints with adhesive tape per manufacturer.

B. Install reinforced vapor retarders in accordance with ASTM E 1643 and manufacturer's instructions.B.

C. Install vapor retarders continuously at locations under slab as indicated on the drawings. Ensure there are no discontinuities in vapor retarder at seams and penetrations.

D. Install vapor retarders in largest practical widths.

E. Ensure subgrade beneath vapor retarder is smooth, level, and compacted with no sharp projections.

F. Join sections of vapor retarder and seal penetrations in vapor retarder with mastic tape. Ensure vapor retarder surfaces to receive mastic tape are clean and dry.

G. Ensure there is no moisture entrapment by vapor retarder due to rainfall or ground water intrusion.

H. Immediately repair holes in vapor retarder with self-adhesive repair tape.

I. Seal around pipes and other penetrations in vapor retarder with pipe boots in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect reinforced vapor retarders from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials.

B. B. Immediately repair damaged vapor retarder in accordance with manufacturer's instructions.

END OF SECTION

SECTION 07 27 00

AIR BARRIERS

PART 1 GENERAL

1.1 REQUIREMENTS

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

1.2 SUMMARY

A. Section includes air leakage criteria for primary air seal building enclosure materials and assemblies; materials and installation methods supplementing other primary air seal materials and assemblies; and air seal materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.

B. Provide continuous air barrier coverage of all walls and roof sheathing surfaces wrapping in to door and window openings. Barrier to be installed in factory for protection of sheathing surfaces during shipping. All seams to be sealed with same product upon delivery to and installation on site.

C. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

D. Related Sections:
Section 07 21 13 – Board Insulation
Section 07 26 00 – Vapor Retarders
Section 07 90 00 – Joint Sealers
Section 09 29 00 – Gypsum Board
Section 26 00 01 – Electrical

1.3 REFERENCES

A. American Society of Civil Engineers:
1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. ASTM International:
1. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.

3. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

4. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference.

C. Sealant, Waterproofing and Restoration Institute:
1. SWRI - Sealant Specification.

1.4 DEFINITIONS

A. Air Barrier: Continuous network of materials and joints providing air tightness, with adequate strength and stiffness to not deflect excessively under air pressure differences, to which it will be subjected in service. It can be comprised of single material or combination of materials to achieve performance requirements.

1.5 DESIGN REQUIREMENTS

A. Perform design work in accordance with ASCE 7.

1.6 SUBMITTALS

A. Section 01 30 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate special control and expansion joint conditions.

C. Design Data: Submit design calculations.

D. Product Data: Submit data on material characteristics, performance criteria, limitations, and sealants.

E. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, product storage and handling criteria.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with SWRI - Sealant and Caulking Guide Specification requirements for materials and installation.

B. Maintain one copy of each document on site.

1.8 MOCKUP

A. Not Used.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01 05 00 – Conduct of the Work: Pre-installation meeting.

B. Convene minimum one week prior to commencing work of this section.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

1.11 SEQUENCING

A. Sequence Work to permit installation of materials in conjunction with related materials and seals.

1.12 COORDINATION

A. Section 01 05 00 – Conduct of the Work: Coordination and project conditions.

B. Coordinate the Work of this section with sections referencing this section.

PART 2 PRODUCTS

2.1 AIR BARRIERS

A. Manufacturers:
1. W.R. Grace and Company, Model "Perm-A-Barrier.
2. W.R. Meadows Company, Model "Air Shield".
3. Carlisle Coatings and Waterproofing, Model "CCW-705".

2.2 COMPONENTS

A. Sheet Seal: Rubberized asphalt bonded to high density cross laminated sheet polyethylene, nominal total thickness of 40 mil.

B. Primer: Recommended by membrane manufacturers, appropriate to application.

C. Substrate Cleaner: Non-corrosive, type recommended by membrane manufacturer, compatible with adjacent materials.

D. Mastic Adhesive: Compatible with sheet seal and substrate, thick mastic of uniform knife grade consistency; as recommended by membrane manufacturer.

2.3 ACCESSORIES

A. Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material as recommended by sheet material manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Clean and prime substrate surfaces to receive adhesive and sealants.

B. Confirm level and plumb installation of units on site prior to sealing seams.

3.2 INSTALLATION

A. Sheet Seal Over Solid Substrate: Secure flexible sheet seal to masonry, wood sheathing board and board insulation materials with adhesive. Caulk with sealant to ensure complete seal. Position lap seal over firm bearing.

B. Air Seal For Wall/Roof Junction: Lap sheet seal onto roof air barrier material and seal adhesive. Caulk to ensure complete air seal. Position lap seal over firm bearing.

C. Install sheet seal between window and door frames and adjacent wall seal materials with adhesive and/or tape as recommended by sheet seal manufacturer. Caulk to ensure complete seal. Position lap seal over firm bearing.

D. Air seal for seams between units: Install sheet seal over seams between units for complete coverage with adhesive and/or table as recommended by sheet seal manufacturer. Caulk to ensure complete seal. Position lap seal over firm bearing.

E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Install air barrier to maintain continuity across different substrates.

3.3 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 60 00 – Product Requirements: Protecting installed construction.

B. Do not permit adjacent work to damage work of this section.

END OF SECTION

SECTION 07 42 13

METAL WALL PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes metal wall panels and accessories of exposed fastener sheet type and concealed fastener composite panel type as indicated in the drawings and described herein:

1. Factory-formed: exposed-fastener, metal wall panels.

2. Finish must conform to the "Metal Construction Association Certified Premium Painted™" designation

3. Coordinate siding with moulding profiles specified under Sheet Metal Flashing and Trim, as noted in Section 7.

4. Panel system requirements include the following components:

   a. Aluminum faced composite panels with mounting system. Panel mounting system including anchorages, shims, furring, fasteners, gaskets and sealants, related flashing adapters, and masking (as required) for a complete watertight installation.

   b. Parapet coping, column covers, soffits, sills, border, and filler items indicated as integral components of the panel system or as designed.

5. The extent of panel system work as indicated on the drawings and in these specifications.

1.3 Related Sections:

Section	06 10 00	–	Miscellaneous Rough Carpentry
Section	07 62 00	–	Sheet Metal Flashing and Trim
Section	07 90 00	–	Joint Protection

1.4 REFERENCES

A. ALUMINUM ASSOCIATION

1. AA-C22-A41: Anodized - Clear Coatings.

2. AA-C22-A42: Anodized - Integral Color Coatings.

B. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION

1. AAMA 508-05:Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

C. AMERICAN SOCIETY FOR TESTING AND MATERIALS

1. E 330 Structural Performance of Exterior Windows, Curtain Walls, and Doors Under the Influence of Wind Loads

2. E 283 Rate of Leakage through Exterior Windows, Curtain Walls, and Doors

3. D 1781Climbing Drum Peel Test for Adhesives

4. E 84 Surface Burning Characteristics of Building Materials

5. D 3363Method for Film Hardness by Pencil Test

6. D 2794Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)

7. D 3359Methods for Measuring Adhesion by Tape Test

8. D 2247Practice for Testing Water Resistance of Coatings in 100% Relative Humidity

9. B 117 Method of Salt Spray (Fog) Testing

10. D 822 Practice for Operating Light and Water Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products

11. D 1308Effect of Household Chemicals on Clear and Pigmented Organic Finishes

12. D 1735Method for Water Fog Testing of Organic Coatings.

13. D 1929Standard Test Method for Determining Ignition Temperature of Plastics

14. D 635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

1.5 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. System shall meet performance criteria as installed. Either test data or signed and sealed engineering calculations shall document the performance of the panel system to meet design loads required.

1. Wind Loading: Design and size components to withstand loads caused by wind pressures as follows:

a. 105 mph

2. Maximum Deflection under Design Loads:

a. 1/180 of span

1.6 SUBMITTALS

A. Product Data: Manufacturer's current product specifications and installation instructions.

B. Shop Drawings: Include small-scale elevations, as required. Show details of trim and flashing conditions, fastening and anchorage methods, weatherproofing techniques, terminations, and penetrations.

C. Submit shop drawings showing project layout and elevations; fastening and anchoring methods; detail and location of joints, sealants, and gaskets, including joints necessary to accommodate thermal movement; trim; flashing; and accessories.

D. Samples:

1. Selection Samples: Submit actual metal chips with full range of colors available for Architect's selection.

2. Verification Samples: Submit two samples of each type of metal panel required, not less than 12 inches (305mm), and illustrating finished panel profile.

3. Two samples of each color or finish selected, 76mm (3") x 102mm (4") minimum.

E. Product Test Reports: Submit copies of test reports or load tables verifying performance capability of panel system:

a. Metal Wall Panels: 24 ga. corrugated panel

b. Fastener test and pull-out calculations

c. Load tables

d. Maintenance Data

F. AFFIDAVIT CERTIFYING MATERIAL MEETS REQUIREMENTS SPECIFIED.

G. TWO COPIES OF MANUFACTURER'S LITERATURE FOR PANEL MATERIAL.

H. CODE COMPLAINCE

1. Documents showing product compliance with the national and local building code shall be submitted prior to the bid. These documents shall include, but not be limited to, appropriate Evaluation Reports and/or test reports supporting the use of the product.

I. ALTERNATE MATERIALS MUST BE APPROVED BY THE ARCHITECT PRIOR TO THE BID DATE.

1.7 QUALITY ASSURANCE

A. Installer: Company specializing in the type of work required for this project, with not less than 2 years of documented experience.

B. Pre-Installation meeting: Convene meeting not less than one week prior to beginning installation between general contractor, installing contractor, owner's representative and manufacturer.

C. Composite Panel Manufacturer shall have a minimum of 20 years experience in the manufacturing of this product.

D. Composite Panel Manufacturer shall be solely responsible for panel manufacture and application of the finish.

E. Fabricator/installer shall be acceptable to the composite panel manufacturer.

F. Fabricator/Installer shall have a minimum 5 years experience of metal panel work similar in scope and size to this project.

G. Field measurements should be taken prior to the completion of shop fabrication whenever possible. However, coordinate fabrication schedule with construction progress as directed by the Contractor to avoid delay of work. Field fabrication may be allowed to ensure proper fit. However, field fabrication shall be kept to

an absolute minimum with the majority of the fabrication being done under controlled shop conditions.

H. Shop drawings shall show the preferred joint details providing a watertight and structurally sound wall panel system that allows no uncontrolled water penetration on the inside face of the panel system as determined by ASTM E 331. Systems not utilizing a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated System) shall provide a means of concealed drainage with baffles and weeps for water which may accumulate in members of the system.

I. Maximum deviation from vertical and horizontal alignment of erected panels: 6mm (1/4") in 6m (20') non-accumulative.

J. Panel fabricator/installer shall assume undivided responsibility for all components of the exterior panel system including, but not limited to attachment to sub-construction, panel to panel joinery, panel to dissimilar material joinery, and joint seal associated with the panel system.

K. Composite panel manufacturer shall have established a Certification Program acceptable to the local Code Authorities.

1.8 DELIVERY, STORAGE & HANDLING

A. Do not deliver materials of this section to project site until suitable facilities for storage and protection are available.

B. Protect materials from damage during transit and at project site. Store under cover, but sloped to provide positive drainage. Do not expose materials with strippable protective film to direct sunlight or extreme heat.

C. Do not allow storage of other materials or allow staging of other work on installed metal panel system.

D. Upon receipt of delivery of metal panel system, and prior to signing the delivery ticket, the installer is to examine each shipment for damage and for completion of the consignment.

E. Protect finish and edges in accordance with panel manufacturer's recommendations.

F. Store material in accordance with panel manufacturer's recommendations.

1.9 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows

evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish Warranty Period: 30 years from date of Substantial Completion.

B. Special Installer's Warranty: Specified form in which Wall Installer agrees to repair or replace components of custom-fabricated sheet metal wall that fail in materials or workmanship within 5 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS GENERAL

A. Manufacturer's Qualifications: All panels are to be factory formed and packaged per job requirements.

B. Coordinate with insulation requirements as noted by Architect.

C. Secondary framing members as required for load criteria and wind requirements.

2.2 PANELS

A. EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

1. Exposed-fastener, Lap seam Metal Wall Panels: Provide Factory-formed, designed to be field assembled by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weather tight installation.

2. Specification is based upon the products of ATAS International, Inc. No other manufacturer of metal wall systems shall be accepted as an alternate product without prior written approval. These substitution requests must meet specifications and must be submitted a minimum of ten (10) days prior to date of bid.

a. Manufacturer shall have a minimum of ten (10) years experience in the factory fabrication of metal wall panels.

b. Manufacturer must be certified to ISO 9001:2008 with design.

3. Corrugated-Profile, Exposed-Fastener Metal Wall Panels: Formed with alternating curved ribs spaced at 2.67 inches o.c. across width of panel.

a. Basis-of Design Product: ATAS International, Inc.; Corrugated Panel - BWC374

b. Manufacturers:

1) ATAS International, Inc.

2) AEP-Span, Model "Nu-Wave Corrugated"

3) MBCI Metal Roof and Wall Systems, Model "PBC Panel"

c. Material: Metallic coated steel sheet - 24 gauge thick

1) Texture: Smooth

2) Finish: KYNAR 5000® PDVF

3) Color as chosen by architect

d. Panel Coverage: 37-1/4"

e. Panel Height: 7/8"

f. Panel Application Orientation: Horizontal.

A. COMPOSITE PANELS

1. ALUCOBOND material manufactured by 3A Composites USA, Inc. 208 West 5th Street, Benton, KY 42025 (800-626-3365 or 270-527-4200)

2. Items of the same function and performance, which have received prior approval from the architect, shall be allowed for this project. Approval shall be based on documentation submitted showing the adequacy of the material.

3. Thickness: 4mm (0.157");

4. Product Performance

a. Bond Integrity

When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), there shall be no adhesive failure of the bond a) between the core and the skin nor b) cohesive failure of the core itself below the following values:

Peel Strength: 115 N mm/mm (22.5 in lb/in) as manufactured
115 N mm/mm (22.5 in lb/in) after 21 days soaking in water at 70°F

b. Fire Performance

ASTM E 84 Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.

ASTM D 1929 A self ignition temperature of 650°F or greater

ASTM D-635 Requires a CC1 classification

5. Finishes

a. Coil coated KYNAR® 500 or HYLAR® 5000 based Polyvinylidene Fluoride (PVDF) or Fluoro Ethylene – Alkyl Vinyl Ether (FEVE) resin in conformance with the following general requirements of AAMA 2605.

1) Color:
   a. Standard color as selected by the owner / architect / engineer from manufacturer's standard color palette.
   b. Clear coat over pretreated natural and brushed aluminum substrates.
2) Coating Thickness:
   a. Colors: 1.0 mil (±0.2 mil).
   b. Clear: 0.50 mil (± 0.05 mil).
3) Hardness: ASTM D-3363; HB minimum using Eagle Turquoise Pencil.
4) Impact:
   a. Test method: ASTM D-2794; Gardner Variable Impact Tester with 5/8" mandrel.
   b. Coating shall withstand reverse impact of 1.5"/pounds per mil substrate thickness.
   c. Coating shall adhere tightly to metal when subjected to #600 Scotch Tape pick-off test. Slight minute cracking permissible. No removal of film to substrate.
5) Adhesion:
   a. Test Method: ASTM D-3359.
   b. Coating shall not pick off when subjected to an 11" x 11" x 1/16" grid and taped with #600 Scotch Tape.
6) Humidity Resistance
   a. Test Method: ASTM D-2247.
   b. No formation of blisters when subject to condensing water fog at 100% relative humidity and 100°F for 4000 hours.
7) Salt Spray Resistance:
   a. Test Method: ASTM B-117; Expose coating system to 4000 hours, using 5% NaCl solution.
   b. Corrosion creepage from scribe line: 1/16" max.
   c. Minimum blister rating of 8 within the test specimen field.
8) Weather Exposure
   a. Outdoor:
      1 Ten-year exposure at 45° angle facing south Florida exposure.
      2 Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.
      3 Maximum chalk rating of 8 in accordance with ASTM D-4214.
      4 No checking, crazing, adhesion loss.
9) Chemical Resistance:

a. ASTM D-1308 utilizing 10% Muriatic Acid for an exposure time of 15 minutes. No loss of film adhesion or visual change when viewed by the unaided eye.

b. ASTM D-1308 utilizing 20% Sulfuric Acid for an exposure time of 18 hours. No loss of film adhesion or visual change when viewed by the unaided eye.

c. AAMA 2605 utilizing 70% reagent grade Nitric Acid vapor for an exposure time of 30 minutes. Maximum color change of 5 Delta E units as calculated in accordance with ASTM D-2244.

b. Anodized components:
Color (Clear): AA-C22-A41 Architectural Class I
High Performance Clear:

1) For application over pretreated natural and brushed aluminum substrates, provide a high performance single coat clear finish.

2.3 FABRICATION

A. Corrugated Panels:

1. Panels to be Factory fabricated in a controlled environment.

2. Panels to be tension leveled during roll forming process.

3. Panels to be produced in longest lengths possible, except when modular units are utilized.

4. Form all components true to shape, accurate in size, square and free from distortion or defects. Cut panels to precise lengths indicated on approved shop drawings or as required by field conditions.

a. Accessories: Factory fabricates trim and flashing components in standard 12-foot lengths.

b. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.

c. Fabricate wall panels as required to maintain fabrication tolerances and to withstand design loads.

d. Elite Series Trim components are to be installed and sequenced in conjunction with architectural drawings and/or manufacturer shop drawings.

5. Fabricate metal wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

6. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

7. Panels, fabrication and installation shall meet the requirements of the Metal Construction Association Preformed Metal Wall Guidelines

B. Composite Panels

1. COMPOSITION:

a. Two sheets of aluminum sandwiching a solid core of extruded thermoplastic material formed in a continuous process with no glues or adhesives between dissimilar materials. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Products laminated sheet by sheet in a batch process using glues or adhesives between materials shall not be acceptable.

2. ALUMINUM FACE SHEETS:

a. Thickness: 0.50mm (0.0197") (nominal)

b. Alloy: AA5000 Series (Anodized material)

3. PANEL WEIGHT:

a. 4mm (0.157"): 1.12 lbs./ft^2

4. TOLERANCES

a. Panel Bow: Maximum 0.8% of any 1828mm (72") panel dimension.

b. Panel Dimensions: Field fabrication shall be allowed where necessary, but shall be kept to an absolute minimum. All fabrication shall be done under controlled shop conditions when possible.

c. Panel lines, breaks, and angles shall be sharp, true, and surfaces free from warp and buckle.

d. Maximum deviation from panel flatness shall be 1/8" in 5'0" on panel in any direction for assembled units. (Non-accumulative - No Oil Canning)

5. SYSTEM CHARACTERISTICS

a. Plans, elevations, details, characteristics, and other requirements indicated are based upon standards by one manufacturer. It is intended that other manufacturers, receiving prior approval, may be acceptable, provided their details and characteristics comply with size and profile requirements, and material/performance standards.

b. System must not generally have any visible fasteners, telegraphing or fastening on the panel faces or any other compromise of a neat and flat appearance.

c. System shall comply with the applicable provisions of the "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA and ANSI/AAMA 302.9 requirements for aluminum windows.

d. Fabricate panel system to dimension, size, and profile indicated on the drawings based on a design temperature of 70°F.

e. Fabricate panel system so that no restraints can be placed on the panel, which might result in compressive skin stresses. The installation detailing shall be such that the panels remain flat regardless of temperature change and at all times remain air and water tight.

f. The finish side of the panel shall have a removable plastic film applied prior to fabrication, which shall remain on the panel during fabrication, shipping, and erection to protect the surface from damage.

6. SYSTEM TYPE

a. Rout and Return Dry: at Facia and Soffit

1) System must provide a perimeter aluminum extrusion with integral weather-stripping as detailed on drawings.

b. Rout and Return Dry: at Wall panels

1) System must provide a perimeter aluminum extrusion with integral weather-stripping as detailed on drawings.

c. No field sealant required in joints unless specifically noted on drawings.

7. SYSTEM PERFORMANCE

a. Composite panels shall be capable of withstanding building movements and weather exposures based on the following test standards required by the Architect and/or the local building code.

b. Wind Load

1) If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

Panels shall be designed to withstand the Design Wind Load based upon the local building code, but in no case less than 20 pounds per square foot (psf) and 30 psf on parapet and corner panels. Wind load testing shall be conducted in accordance with ASTM E330 to obtain the following results.

Normal to the plane of the wall between supports, deflection of the secured perimeter-framing members shall not exceed L/175 or 3/4", whichever is less.

Normal to the plane of the wall, the maximum panel deflection shall not exceed L/60 of the full span.

Maximum anchor deflection shall not exceed 1/16".

At 1-1/2 times design pressure, permanent deflections of framing members shall not exceed L/100 of span length and components shall not experience failure or gross permanent distortion. At connection points of framing members to anchors, permanent set shall not exceed 1/16".

c. Air/Water System Test

1) If system tests are not available, mock-ups shall be constructed and tests performed under the direction of an independent third party laboratory, which show compliance to the following minimum standards:

Air Infiltration - When tested in accordance with ASTM E283, air infiltration at 1.57 psf must not exceed 0.06 cfm/ft^2 of wall area.

Water Infiltration - Water infiltration is defined as uncontrolled water leakage through the exterior face of the assembly. Systems not using a construction sealant at the panel joints (i.e. Rout and Return Dry and Rear Ventilated Systems) shall be designed to drain any water leakage occurring at the joints. No water infiltration shall occur in any system under a differential static pressure of 6.24 psf after 15 minutes of exposure in accordance with ASTM E331.

Pressure Equalized Rain Screen Systems shall comply with AAMA 508-05 Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems

2.4 ACCESSORIES

A. Extrusions, formed members, sheet, and plate shall conform with ASTM B209 and the recommendations of the manufacturer.

B. Panel stiffeners, if required, shall be structurally fastened or restrained at the ends and shall be secured to the rear face of the composite panel with silicone of sufficient size and strength to maintain panel flatness. Stiffener material and/or finish shall be compatible with the silicone.

C. Sealants and gaskets within the panel system shall be as per manufacturer's standards to meet performance requirements.

D. Fabricate flashing materials from 0.030" minimum thickness aluminum sheet painted to match the adjacent curtain wall / panel system where exposed. Provide a lap strap under the flashing at abutted conditions and seal lapped surfaces with a full bed of non-hardening sealant.

E. Fasteners (concealed/exposed/non-corrosive): Fasteners as recommended by panel manufacturer. Do not expose fasteners except where unavoidable and then match finish of adjoining metal.

PART 3 EXECUTION

3.1 PREPARATION

A. Field Measurements

1. Field measurements should be taken by the installer for verification of dimensional correctness in relationship to original plans, prior to providing manufacturer with a bill of material.

B. Delivery, Storage and Handling

1. Do not deliver materials of this section to project site until suitable facilities for storage and protection are available.

2. Protect materials from damage during transit and at project site. Store under cover, but sloped to provide positive drainage. Do not expose materials with strippable protective film to direct sunlight or extreme heat.

3. Do not allow storage of other materials or allow staging of other work on installed metal panel system.

4. Upon receipt of delivery of metal panel system, and prior to signing the delivery ticket, the installer is to examine each shipment or damage and for completion of the consignment.

C. Sequencing and Scheduling

1. Installer shall coordinate with general contractor as to scheduled delivery time after receipt of field verified bill of material by manufacturer as it relates to actual project scheduling.

3.2 INSPECTION

A. Surfaces to receive panels shall be even, smooth, sound, clean, dry and free from defects detrimental to work. Notify contractor in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with erection until unsatisfactory conditions have been corrected.

B. Surfaces to receive panels shall be structurally sound as determined by a registered Architect/Engineer.

3.3 METAL WALL PANEL INSTALLATION, GENERAL

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels by torch is not permitted.

2. Rigidly fasten metal wall panels and allow for thermal expansion and contraction as required by the panel manufacturer. Pre-drill panels as required.

3. Install screw fasteners.

4. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing and material compatibility.

6. Provide weatherproof seals for pipe and conduit penetrating exterior walls.

7. Elite Series trim and flashing components shall be installed in accordance with manufacturer's installation instructions to ensure proper weatherproofing. Additional sealants and closures may be required in accordance with manufacturer's installation details.

B. Fasteners: Use fasteners of size and length as required for compatibility with substrate.

1. Steel Wall Panels: Use stainless-steel fasteners or metallic coated fasteners for surfaces exposed to the exterior and galvanized steel fasteners for surfaces exposed to the interior.

2. Exposed fasteners shall have a high performance factory applied coating to match paint color.

3. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

C. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies.

D. Provide water and air infiltration retarder / barriers as noted within project documents.

3.4 COMPOSITE PANEL INSTALLATION

A. Erect panels plumb, level, and true.

B. Attachment system shall allow for the free and noiseless vertical and horizontal thermal movement due to expansion and contraction for a material temperature range of -20°F to +180°F. Buckling of panels, opening of joints, undue stress on fasteners, failure of sealants or any other detrimental effects due to thermal movement will not be permitted.

C. Fabrication, assembly, and erection procedure shall account for the ambient temperature at the time of the respective operation.

D. Panels shall be erected in accordance with an approved set of shop drawings.

E. Anchor panels securely per engineering recommendations and in accordance with approved shop drawings to allow for necessary thermal movement and structural support.

F. Conform to panel fabricator's instructions for installation of concealed fasteners.

G. Do not install component parts that are observed to be defective, including warped, bowed, dented, abraised, and broken members.

H. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in visual imperfection or a failure in performance. Return component parts which require alteration to shop for refabrication, if possible, or for replacement with new parts.

I. Separate dissimilar metals and use gasketed fasteners where needed to eliminate the possibility of corrosive or electrolytic action between metals.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete sheet metal roofing assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

2. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual" and NRCA Waterproofing Manual. Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3. Panels, fabrication and installation shall meet the requirements of the Metal Construction Association Preformed Metal Wall Guidelines.

B. Coordinate with installation of:

1. Rough Carpentry, as noted in Section 6

2. Sheet Metal Flashing and Trim, as noted in Section 7

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal wall panels are installed. Maintain in a clean condition during construction.

B. Protection:

1. Provide as required completed work of this section will be without damager or deterioration at date of substantial completion.

C. Touch up minor abrasions with matching paint provided by panel manufacturer. Remove and replace panels that cannot be satisfactorily touched up. See Metal Construction Association Technical Bulletin #95-1051.

D. Sweep and remove chips, shavings and dust from roof on a daily basis during installation period. Leave installed work clean, free from grease, finger marks and stains. Remove all protective masking from material immediately after installation of product.

E. Upon completion of installation, remove scraps and debris from project site.

F. After metal wall panel installation, clear weep holes and drainage channels of obstructions, dirt and sealant.

3.7 ADJUSTING AND CLEANING

A. Remove and replace panels damaged beyond repair as a direct result of the panel installation. After installation, panel repair and replacement shall become the responsibility of the General Contractor.

B. Repair panels with minor damage.

C. Remove masking (if used) as soon as possible after installation. Masking intentionally left in place after panel installation on an elevation, shall become the responsibility of the General Contractor.

D. Any additional protection, after installation, shall be the responsibility of the General Contractor.

E. Make sure weep holes and drainage channels are unobstructed and free of dirt and sealants.

F. Final cleaning shall not be part of the work of this section.

END OF SECTION

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SECTION 07 53 05

ELASTOMERIC MEMBRANE ROOFING - MECHANICALLY ATTACHED
(FILED SUB BID REQUIRED)

PART 1 GENERAL

1.00 FILED SUB-BID REQUIREMENT

A. The Masonry filed sub-bid includes the Work specified in the following Sections:
   1. 07 53 05, Elastomeric Membrane Roofing – Mechanically Attached

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings: Cover Sheet, A-1.1, A-1.3, A-2.0, A-3.0, A-3.1, A-3.2, A-3.3, A-5.0, A-5.1, A-5.2, A-5.3, A-5.4 & A-7.1.

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

1.2 SUMMARY

A. Scope: To install a mechanically-attached PVC roofing membrane, flashings and all other components necessary to a complete, weathertight roofing system.

B. Section includes vapor retarder over deck surface; mechanically attached insulation; mechanically attached sheathing over insulation and mechanically attached membrane roofing, base flashings, roofing membrane expansion joints, cant strips, reglets and counterflashings.

C. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

D. Related Work

1. The work includes but is not limited to the installation of:

   a. Substrate Preparation
   b. Roof Drains
   c. Vapor Retarder
   d. Wood Blocking
   e. Insulation
   f. Separation Layers
   g. Roof Membrane
   h. Fasteners
   i. Adhesive for Flashings
   j. Roof Membrane Flashings
   k. Metal Flashings
   l. Sealants

E. Related Sections:
   1. Division 1: General Requirements (All Sections)
   2. Section 02 41 19 – Selective Structure Demolition
   3. Section 06 10 53 – Miscellaneous Rough Carpentry: wood nailers and cant strips.
   4. Section 07 21 13 – Board Insulation
   5. Section 07 26 00 – Vapor Retarders: Perimeter vapor seal between translucent panel system and adjacent construction.
   6. Section 07 62 00 – Sheet Metal Flashing and Trim
   7. Section 07 90 00 –Joint Protection
   8. Section 08 62 00 – Unit Skylights: skylight frame and integral curb.
   9. Section 26 00 00 – Mechanical

1.3 REFERENCES

A. ASTM International:
   1. ASTM C79/C79M - Standard Specification for Gypsum Sheathing Board.
   2. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
   3. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

   4. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers -Tension.
   5.
   6. ASTM D624 - Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   7. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
   8. ASTM D822 - Standard Practice for Conducting Tests on Paint and Related Coatings and Materials Using Filtered Open-Flame Carbon-Arc Exposure Apparatus.
   9. ASTM D1004 - Standard Test Method for Initial Tear Resistance of Plastic Film and Sheeting.

10. ASTM D4434 - Standard Specification for Poly(Vinyl Chloride) Sheet Roofing.
11. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

12. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings.

B. FM Global:
1. FM 4470 - Approval Standard for Class 1 Roof Coverings.
2. FM DS 1-28 - Wind Loads to Roof Systems and Roof Deck Securement.

C. National Roofing Contractors Association:
1. NRCA - The NRCA Roofing and Waterproofing Manual.

D. Underwriters Laboratories Inc.:
1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
2. UL 790 - Tests for Fire Resistance of Roof Covering Materials.
3. UL - Fire Resistance Directory.
4. UL 1256 - Fire Test of Roof Deck Construction.
5. UL 1897 - Uplift Tests for Roof Covering Systems.

E. SPRI RP-4 (Single Ply Roofing Institute) - Wind Design Guide for Ballasted Single Ply Roofing Systems.

1.4 SYSTEM DESCRIPTION

A. 72 mil, single ply PVC membrane roofing system with weft inserted low-shrink, anti-wicking polyester fabric and thermoplastic film laminated to both sides, sheathing, vapor retarder, insulation, and mechanically attached membrane.

B. Mechanical fasteners

1.5 PERFORMANCE REQUIREMENTS

A. Conform to applicable code for roof assembly fire hazard requirements.

B. UL 790: Class A Fire Hazard Classification.

C. Roof Assembly Classification: FM Class 1 Construction, windstorm classification of 1-60 1-90 1-180, in accordance with FM DS 1-28.

D. Vapor Retarder Permeance: Maximum 1 perm perms when tested in accordance with ASTM E96, Procedure A.

1.6 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate joint and termination detail conditions, conditions of interface with other materials. Indicate membrane layout and seam locations.

C. Product Data: Submit characteristics on membrane materials, fasteners, seaming materials, flashing materials, and colored coating.

D. Samples: Submit two 24x24 inch in size illustrating membrane joints and color.

E. Manufacturer's Installation Instructions: Submit special precautions required for seaming membrane and applying colored coating.

F. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

G. Manufacturer's Field Reports: Indicate procedures followed, ambient temperatures, humidity, and wind velocity during application.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.

B. .Roof Assembly Fire Classification: Minimum Class A Class B Class C when tested in accordance with ASTM E108 or UL 790.
   1. Roof Assembly with Foam Insulation: Passes FM 4450 or UL 1256.

C. Surface Burning Characteristics
   1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84 NFPA 255 UL 723.

D. Apply label from agency approved by authority having jurisdiction to identify each roof assembly component.

E. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing Work of this section with minimum years documented experience and approved as an installer by the manufacturer.

1.9 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Preinstallation meetings.

B. Convene minimum one week prior to commencing Work of this section.

C. Review preparation and installation procedures and coordinating and scheduling required with related work.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.

C. Store products in weather protected environment, clear of ground and moisture. Protect foam insulation from direct sunlight exposure.

D. Store products in weather protected environment, clear of ground and moisture. Protect foam insulation from direct sunlight exposure.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply roofing membrane during inclement weather ambient temperatures below degrees 40 F or above degrees 90F without proper weather protection.

C. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

D. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.12 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate Work with installation of associated roof penetrations and metal flashings, as Work of this section proceeds.

1.13 WARRANTY

A. Section 01 70 00 - Execution Requirements: Requirements for warranties.

B. Furnish 15 year manufacturer's warranty including coverage of materials and installation and resulting damage to building resulting from failure to resist penetration of moisture.

PART 2 PRODUCTS

2.1 SINGLE PLY ROOFING - MECHANICALLY ATTACHED

A. Manufacturers:

1. Manufacturer shall manufacture their own sheet membrane. Manufacturers outsourcing sheet supply shall not be considered.
2. Sarnafil, Inc., S327 mechanically attached "Sarnafast" system
3. Fibertite
4. Dura Last Roofing Systems

2.2 COMPONENTS

A. Membrane: PVC; reinforced, 72 mil thick; white color; conforming to the following criteria:

Parameters	ASTM Test Method	Physical Properties
Reinforcing Material	-	Polyester
Overall Thickness, min., inches (mm)	D751	0.072inches
Breaking Strength, min., lbf/in. (KN/m)	D751	230 (40.0)
Elongation at Break, min.	D751	20%
Seam strength*, min. (% of breaking strength)	D751	85
Tensile Strength	D751	7200 psi
Moisture Vapor Perm	E96	.25 perms
Retention of Properties After Heat Aging	D3045	-
Breaking Strength, min., (% of original)	D751	95
Elongation, min., (% of original)	D751	90
Tearing Strength, min., lbf (N)	D1004	50 (220)
Exposure	D822	8.1 million langleys
Low Temperature Bend, -40°F (-40°C)	D2136	Pass
Accelerated Weathering Test (Florescent Light, UV exposure)	G154	Pass
Cracking (7x magnification)	-	None
Discoloration (by observation)	-	Negligible
Crazing (7 x magnification)	-	None
Linear Dimensional Change	D1204	0.1%
Weight Change After Immersion in Water	D570	2.5%
Static Puncture Resistance, 33 lbf (15 kg)	D5602	Pass
Dynamic Puncture Resistance, 14.7 ft-lbf (20 J)	D5635	Pass

B. Seaming Materials: As recommended by membrane manufacturer.

C. Gypsum Sheathing: DensDeck® Prime.
1. A fire-tested, gypsum hardboard with glass-mat facers and a pre-primed surface on one side. Provid in a 4 x 8 ft board size and in a thickness of 1/4.

D. Battens: as fabricated by manufacturer.

E. Disc Washers and Screws: as specified by manufacturer.

F. ASTM C1013, faced rigid cellular polyisocyanurate roof insulation, with the following characteristics:
1. Board Density: 2.0 lb/cu ft
2. Board Edges: ship lap
3. R Value: an average of 20.

G. Flexible Flashings: Same material as membrane; white color; by same manufactured.

H. Counterflashings: lead coated copper, as specified in Section 07620.

I. Manufactured Roof Specialties: As specified in Section 07710.

2.3 ACCESSORIES

A. Fiber Cant and Tapered Edge Strips: Asphalt impregnated wood fiberboard, preformed to configuration as detailed.

B. Sheathing Fasteners: Appropriate for purpose intended and approved by system manufacturer; length required for thickness of material with metal washers.

C. Insulation Joint Tape: Asphalt treated glass fiber reinforced; 6 inches wide; self adhering.

D. Roofing Nails: Galvanized, hot dipped or non-ferrous type, size as required to suit application.

E. Sealants: As recommended by membrane manufacturer.

F. Strip Reglet Devices: Galvanized steel Extruded plastic; maximum possible lengths per location, with attachment flanges.

G. Stack Boots: Flexible boot and collar for pipe stacks through membrane.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions.

B. Verify surfaces and site conditions are ready to receive work.

C. Verify deck is supported and secure.

D. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, and suitable for installation of roof system.

E. Verify deck surfaces are dry and free of snow or ice.

F. Confirm dry deck by moisture meter with moisture content acceptable to roofing manufacturer.

G. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood cant strips wood nailing strips and reglets are in place.

3.2 PREPARATION

1. Inspect roof substrate to assure clean dry conditions free of defects prior to any installation. Commencement of roof installation in an area indicates acceptance of substrate of that area.

3.3 INSTALLATION

A. Vapor Retarder:
   1. the vapor retarder shall be laid directly over the deck or on a support board with all side and end joints sealed in accordance with the manufacturer's instructions. The vapor retarder shall be sealed to all penetrations and terminations. The vapor retarder shall be loosely laid.

B. Insulation Application:
   1. Ensure vapor retarder is clean and dry.
   2. Apply adhesive to deck. Embed insulation into adhesive with full contact.
   3. Apply adhesive to top surface of insulation. Embed second layer of insulation into adhesive, with joints staggered minimum 6 inch from joints of first layer.
   4. Place constant thickness first layer and tapered thickness insulation second layer to required slope pattern.
   5. Minimum Total Insulation Thickness: To average R-Value of R-38 for tapered insulation.
   6. Place boards perpendicular to deck flutes with edges over flute surface for bearing support.
   7. Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
   8. Lay tapered boards Cut boards to slope for distance of 24 inches back from roof drains for positive drainage.
   9. Apply no more insulation than can be covered with membrane in same day.
   10. Tape joints of insulation.

C. Sheathing:
   1. Install gypsum sheathing on insulation.
   2. Lay sheathing with long side at right angle to metal deck flutes. Provide support at ends.
   3. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface. Tape joints.
   4. Mechanically fasten sheathing to roof deck, in accordance with Factory Mutual.

D. Membrane Application:
   1. Apply membrane and mechanical attachment devices.
   2. Install mechanical fasteners as recommended by manufacturer.
   3. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.
   4. Overlap edges and ends and seal by heat welding , minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

   5. Extend membrane up cant strips minimum of 8 inches onto vertical surfaces.
   6. Seal membrane around roof penetrations.

E. Flashings And Accessories:
   1. Apply flexible flashings to seal membrane to vertical elements.
   2. Secure to nailing strips at 4 inches on center and reglets.
   3. Install prefabricated roofing control and expansion joints to isolate roof into areas as indicated on Drawings. Make joints watertight.
   4. Coordinate installation of roof drains sumps and related flashings.
   5. Seal flashings and flanges of items penetrating membrane.
   6. Install walkway pads. Space pad joints to permit drainage.

3.4 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and Inspection Services 01700 - Execution Requirements: Testing, adjusting, and balancing.

B. Require site attendance of roofing and insulation materials' manufacturers daily during installation of the Work.

3.5 CLEANING

A. Section 01700 - Execution Requirements: Final cleaning.

B. In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.

C. Repair or replace defaced or disfigured finishes caused by Work of this section.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01700 - Execution Requirements: Protecting installed construction.

B. Protect building surfaces against damage from roofing work.

C. Where traffic must continue over finished roof membrane, protect surfaces.

END OF SECTION

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SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 REQUIREMENTS

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

1.2 SUMMARY

A. Section includes flashings and counterflashings, caps and mouldings and fabricated sheet metal items, as indicated in Schedule.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Related Sections:
1. Section 02 41 09 – Selective Structure Demolition
2. Section 04 26 13 – Masonry Veneer
3. Section 06 10 53 – Miscellaneous Rough Carpentry
4. Section 07 42 13 – Metal Wall Panels
5. Section 07 90 00 – Joint Protection
6. Section 08 62 00 – Unit Skylights: metal curbs

1.3 REFERENCES

A. American Architectural Manufacturers Association:
1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
2. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. ASTM International:
1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. Federal Specification Unit:
1. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.

D. Sheet Metal and Air Conditioning Contractors:
1. SMACNA - Architectural Sheet Metal Manual.

1.4 SUBMITTALS

A. Section 0130 00 - Submittals: Submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Product Data: Submit data on manufactured components metal types, finishes, and characteristics.

D. Samples:
   1. Submit two samples, 12 inch x length or width required inches in size illustrating typical seam, external corner, internal corner, ridge, junction to vertical dissimilar surface, material and finish.
   2. Submit two samples 12 x 12 inch in size illustrating metal finish color.

1.5 QUALIFICATIONS

A. Fabricator and Installer: Company specializing in sheet metal work with minimum three years documented experience.

1.6 PRE-INSTALLATION MEETINGS

A. Pre-installation meeting as determined by Architect.

B. Convene minimum one week prior to commencing work of this section.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials causing discoloration or staining.

1.8 COORDINATION

A. Section 01 05 00 – Conduct of the Work: Coordination and project conditions.

PART 2 PRODUCTS

2.1 SHEET METAL FLASHING AND TRIM

A. Manufacturers:
   1. ATAS International, Inc. (Basis-of Design)
   2. MM Systems Corporation
   3. Cheney Flashing Co. custom
   4. Metal-Era Inc. Model.
   5. Substitutions: Section 01 60 00 - Product Requirements.

B. Pre-Finished Aluminum Sheet: ASTM B209, manufacturer's standard alloy and temper for specified finish; 24 ga.; plain finish shop pre-coated with PVDF (polyvinylidene fluoride) coating.

1. Texture: Smooth
2. Finish: KYNAR 5000® PDVF
3. Color 3: Silversmith (28) PREMIUM COLOR
4. Color 5: Classic Bronze (01)

2.2 ACCESSORIES

A. Fasteners: Same metal and finish as flashing and mouldings with soft neoprene washers.

B. Sealant: specified in Section 07 90 00.

C. Plastic Cement: ASTM D4586, Type I.

2.3 FABRICATION

A. Form sections shape indicated on Drawings, accurate in size, square, and free from distortion or defects.

B. Fabricate cleats of same material as sheet metal, interlocking with sheet.

C. Form pieces in longest possible lengths.

D. Hem exposed edges on underside 1/2 inch; miter and seam corners.

E. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

F. Fabricate corners from one piece with minimum 18 inch long legs; seam at aluminum, solder at lead coated for rigidity, seal with sealant.

G. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

H. Fabricate vertical to horizontal transitions with ¼" vertical return to form drip.

I. Fabricate flashings to allow toe to extend 2 inches over roofing membrane. Return and brake edges.

J. Seal metal joints.

2.4 FACTORY FINISHING

A. PVDF (polyvinylidene fluoride) coating: Multiple coat, thermally cured, fluoropolymer system conforming to AAMA 2605.

B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 05 00 – Conduct of the Work: Coordination and project conditions.

B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

C. Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Install surface mounted reglets to lines and levels indicated on Drawings. Seal top of reglets with sealant.

C. Paint concealed metal surfaces with protective backing paint to minimum dry film thickness of 15 mil.

3.3 INSTALLATION

A. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Testing and Inspection Services.

B. Inspection will involve surveillance of Work during installation to ascertain compliance with specified requirements.

3.5 SCHEDULE

A. Fascia, Dado, Trim and Skirtboard: 24 ga. Aluminum.

B. Counterflashings at Roofing Terminations (over roofing base flashings): 24 ga. Aluminum.

C. Counterflashings at Curb-Mounted Roof Items, including skylights: 24 ga. Aluminum.

END OF SECTION

SECTION 07 84 00

FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes firestopping and through-penetration protection systems materials and accessories at new wall, roof and floor ceiling penetrations.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

1.2 SYSTEM DESCRIPTION

A. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479, to achieve fire rating as noted on Drawings.

B. Surface Burning: ASTM E84, UL 723 with maximum flame spread / smoke developed rating of 25/450.

C. Firestop interruptions to fire rated assemblies, materials, and components.

1.3 SUBMITTALS

A. Product Data: Submit data on product characteristics, performance and limitation criteria.

B. Design Data: Provide schedule of opening locations and sizes, penetrating items, and required listed design numbers to seal openings to maintain fire resistance rating of adjacent assembly.

C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

B. Maintain this minimum temperature before, during, and minimum 3 days after installation of materials.

C. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 FIRESTOPPING

A. Manufacturers:
1. A/D Fire Protection Systems, Inc.
2. Dow Corning Corp.
3. Fire Trak Corp.
4. Hilti Corp.
5. 3M fire Protection Products
6. Nelson Firestop Products
7. Pecora Corporation
8. Premier Refractories & Chemicals Inc.
9. United States Gypsum Co.
10. Substitutions: Permitted.

B. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.
3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber/ ceramic wool fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

C. Color: Black.

2.2 ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.

B. Dam Material: Permanent:
1. As specified by chosen manufacturer.

C. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify openings are ready to receive work of this section.

3.2 PREPARATION

A. Clean substrate surfaces of matter effecting bond of firestopping material.

B. Install backing materials to arrest liquid material leakage.

3.3 APPLICATION

A. Apply primer where recommended by manufacturer for specific material and substrate.

B. Apply firestopping material in sufficient thickness to achieve required fire rating, to uniform density and texture.

C. Install material at walls or partition openings containing penetrating sleeves, piping, duct work, conduit and other items, requiring firestopping.

D. Dam material as specified by manufacturer.

END OF SECTION

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SECTION 07 90 00

JOINT PROTECTION

PART 1 GENERAL

1.1 REQUIREMENTS

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

1.2 SUMMARY

A. Section includes sealants and joint backing.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

1.3 Related Sections:

A. Sections as listed:
1. Section 04 26 13 – Veneer Masonry
2. Section 06 10 53 – Miscellaneous Rough Carpentry
3. Section 07 26 00 – Vapor Retarders
4. Section 07 27 00 – Air Barriers
5. Section 07 62 00 – Sheet Metal Flashing and Trim
6. Section 08 41 13 – Aluminum Storefront
7. Section 09 22 16 – Non-Structural Metal Framing
8. Section 09 29 00 – Gypsum Board
9. Section 09 30 00 – Tiling
10. Section 09 90 00 – Painting

1.4 REFERENCES

A. ASTM International:
1. ASTM C834 - Standard Specification for Latex Sealants.
2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
3. ASTM C1193 - Standard Guide for Use of Joint Sealants.
4. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
5. ASTM D1667 - Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).

1.5 SUBMITTALS

A. Product Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

B. Samples: Submit two samples, 2x8 inch in size illustrating sealant colors for selection.

C. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.

D. Warranty: Include coverage for installed sealants and accessories failing to achieve airtight seal, watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.6 MOCKUP

A. Section 01 60 00 Product: Requirements for mockup.

B. Construct mockup of sealant joints in conjunction with window, wall, mockups specified in other sections.

C. Construct mockup with specified sealant types and with other components noted.
1. Determine preparation and priming requirements based on manufacturers recommendations; take action necessary for correction of failure of sealant tests on mock-up.
2. Verify sealants, primers, and other components do not stain adjacent materials.

D. Locate where directed by Architect/Engineer.

E. Incorporate accepted mockup as part of Work.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.1 JOINT SEALERS

A. Manufacturers:
1. Tremco.
2. GE Silicones
3. Mameco International Inc.
4. Pecora Corp.
5. Sika Corp.
6. Polytite
7. Simpson
8. Substitutions: Permitted.

B. Product Description:
1. Type S1 - High Performance General Construction (Nontraffic) Sealant: Silicone; ASTM C920, Type S, Grade NS, Class 25, Uses M, G, and A; single component, natural curing.
a. Type: SC.

b. Manufactured by General Electric "Silpruf"
c. Color: Colors as selected.
d. Applications: Use for:
   1) Control, expansion, and soft joints in masonry.
   2) Joints between concrete and other materials.
   3) Joints between metal frames and other materials.
   4) Joints between metal frames and metal surround.
   5) Other exterior nontraffic joints for which no other sealant is indicated.

2. Type S2 - High Performance General Construction (Nontraffic) Sealant: Silicone; ASTM C920, Type S, Grade NS, Class 25, Uses M, G, and A; single component, moisture curing.
   a. Type: SE.
   b. Manufactured by General Electric "Construction 1200"
   c. Color: Colors as selected.
   d. Applications: Use for:
      1) Control, expansion, and soft joints in masonry.
      2) Joints between concrete and other materials.
      3) Joints between metal frames and other materials.
      4) Joints between metal frames and metal surround.
      5) Other exterior nontraffic joints for which no other sealant is indicated.

3. Type A1 - General Purpose Interior Sealant (Sealant): Acrylic emulsion latex; ASTM C834, single component, paintable.
   a. Type: A1
   b. Manufactured by Tremco "Trimflex 834".
   c. Color: Standard colors matching finished surfaces as selected.
   d. Applications: Use for:
      1) Interior wall and ceiling control joints
      2) Joints between door and window frames and wall surfaces
      3) Other interior joints for which no other type of sealant is indicated.

4. Type B1 - Butyl Sealant: ASTM C920, Grade NS, Class 12-1/2, Use NT; single component, solvent release, non-skinning, non-sagging.
   a. Type: B1
   b. Manufactured by Tremco "Butyl Sealant".
   c. Color: Color as selected.
   d. Movement Capability: Plus and minus 12-1/2 percent.
   e. Service Temperature Range: -13 to 180 degrees F.
   f. Shore A Hardness Range: 24 to 30.

5. Type P1 - Polyurethane Sealant: ASTM C920, Grade NS, Class 25, Uses NT, M, T, A, & O; multi component, chemical curing, non-sag, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type.
   a. Type: P1

b. Manufactured by Tremco "Dymeric FC.
c. Color: Standard colors matching finished surfaces as selected.
d. Movement Capability: Plus and minus 50 percent.
e. Service Temperature Range: -40 to 180 degrees F.
f. Shore A Hardness Range: 20 to 35.

1. Type P-2 - Polyurethane Sealant: ASTM C920, Grade NS, Class 25, Uses NT, M, T, A, & O; multi component, chemical curing, non-sag, non-staining, non-bleeding, capable of continuous water immersion, non-sagging type.
   a. Type: P2
   b. Manufactured by Tremco "Dymeric 511.
   c. Color: Standard colors matching finished surfaces as selected.
   d. Movement Capability: Plus and minus 50 percent.
   e. Service Temperature Range: -40 to 180 degrees F.
   f. Shore A Hardness Range: 20 to 35.
   g. Shore A Hardness Range: 15 to 35.
2.

3. Type PS1 - Sealant - Elastic type epoxy A-H, Groove and Crack Filler #250", with following physical properties in cured state:
   a. Type: FS-1.
   b. Properties:

Property	Aged I Week, 77° F	Aged 1 Year, 77 °F
Tensile strength	325 lb./in^2	600 lb./in.^{2}
Elongation	110%	100%
Shore A Hardness	75	96

2.2 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, round, closed cell polyelthylene foam rod; oversized 30 to 50 percent larger than joint width; manufactured by.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Inert filler for use with sealant FS1 shall be course, dry, mason's sand, free from material, passing No. 200 sieve.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.

B. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

A. Remove loose materials and foreign matter impairing adhesion of sealant.

B. Clean and prime joints.

C. Perform preparation in accordance with ASTM C1193.

3.3 INSTALLATION

A. Perform installation in accordance with ASTM C1193.

B. Perform acoustical sealant application work in accordance with ASTM C919.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints concave.

H. Joint shall be absolutely clean and dry when sealant is applied. Dust, dirt, and, mortar, droppings, construction debris, and other foreign material shell be blown from joint by strong air jet immediately before priming and caulking joint. Where required, Inert filler shall be added after joint has been cleaned."

I. Where recommended by sealant manufacturer, primer shall be applied before compound is installed.

J. Primer and sealant shall be applied only when surrounding temperature is > 85°F, and permanent building heating system in work area is operable.

K. Joint or space to be sealed shall be packed tight with filler material If necessary to create required joint dimensions or to provide 'gunning" resistance required to produce sound and uniform bead. Filler materials shall be held sufficiently firm in joint to provide adequate resistance when sealant is being gunned into joint.

L. Sealant installation in concrete work shall be delayed for as long as practicable following constructlon, to permit as much as possible of drying shrinkage to occur before sealant is applied.

M. Sealant shall be applied with gun, using nozzle of proper size to fit joint width, be forced into joint with sufficient pressure to expel all air and fill joint solid. Superficial joint pointing with skin bead will not be accepted. Sealant shall be uniformly smooth and"wrinkle free, and shall have flush or slightly concave joint profile when dry. Intersections of sealant beads shall form neat miters. Sealant at joint edges shall be flush with adjacent surface edges. Excess sealant material shall be removed, Improperly filled or finished joints shall be raked out and resealed.

N. Adjacent surfaces shall not be soiled. Spillage and excess material shall be removed immediately, leaving no stain. Masking shall be used to protect surrounding surfaces, if required to prevent staining. Masking tape shall be removed immediately after tooling" Sealant, Adjacent surfaces which have been soiled or stalned by operations under this Section shall be cleaned to equal their condition before start of caulking and sealing work.

O. Foot traffic shall be kept off joint for 48 hours following caulking and sealing, and wheeled traffic for 7 days.

3.4 SCHEDULE

A. Exterior Joints for Which No Other Sealant Type is Indicated: Type S2.

B. Lap Joints in Exterior Sheet Metal Work: Type B1.

C. Butt Joints in Exterior Metal Work and Siding: Type S2

D. Joints Between Exterior Metal Frames and Adjacent Work (except masonry): Type S2.

E. Under Exterior Door Thresholds: Type S2

F. Interior Joints for Which No Other Sealant is Indicated: Type A1.

G. Joints Between Plumbing Fixtures and Walls and Floors: Type A1

H. Air barrier lap seams and door and window casings where taped: Type P1.

I. Control, Expansion, and Soft Joints in Masonry, and Between Masonry and Adjacent Work: Type P2.

END OF SECTION

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Standard hollow-metal steel frames.
   2. Standard hollow-metal steel doors.

B. Alternates: Add Alternate #1: Alterations and Reconfiguration of the Main Office.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
   1. Section 06 10 53 – Miscellaneous Rough Carpentry
   2. Section 08 14 16 – Flush Wood Doors
   3. Section 08 71 00 – Door Hardware
   4. Section 09 90 00 – Painting: for field painting steel doors and frames.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.

B. Shop Drawings:

   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.

8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an ASSA ABLOY Group Company.
3. CURRIES Company; an ASSA ABLOY Group Company.
4. Mesker Door Inc.
5. Pioneer Industries, Inc.
6. Republic Builders Products Company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 088000 - GLAZING.

J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
   a. Thermal-Rated (Insulated) Exterior Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch-thick end closures or channels of same material as face sheets.
4. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

C. Interior Doors: Face sheets fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior door requirements. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:

1. Level 2 and Physical Performance Level B (Heavy Duty), Model 2 (Seamless), 1-3/4 inches thick.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

E. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Glazing: clear, tempered, size as indicated in drawings

2.4 STANDARD STEEL FRAMES

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.

1. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
2. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:
1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.

Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as doorframe. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Three anchors per jamb up to 60 inches high.
        2) Four anchors per jamb from 60 to 90 inches high.
        3) Five anchors per jamb from 90 to 96 inches high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
        5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

    b. Compression Type: Not less than two anchors in each jamb.
    c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 08 71 00 - DOOR HARDWARE.

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
2. Reinforce doors and frames to receive nontemplated, 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 Section 260001 - ELECTRICAL WORK.

F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pre-treating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
   a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   b. Install frames with removable glazing stops located on secure side of opening.
   c. Install door silencers in frames before grouting.
   d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   e. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   f. Field apply bituminous coating to backs of frames that are filled with grout.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
7. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 21 20

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Solid-core doors with wood-veneer faces.
2. Solid Core Doors with wood veneer faces and vision panel glazing.
3. Factory machining for hardware.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

Division 1 – General Requirements, all Sections.
Section 02 41 09 – Selective Demolition
Section 06 10 00 - Rough Carpentry
Section 06 20 00 – Finish Carpentry
Section 07 90 00 – Joint Sealers
Section 09 90 00 – Painting

1.3 REFERENCES

A. American National Standards Institute:
1. ANSI A135.4 - Basic Hardboard

B. ASTM International:
1. ASTM E413 - Standard Classification for Rating Sound Insulation.

C. AWI - Quality Standards of the Architectural Woodwork Institute – Eighth Edition

D. Hardwood Plywood and Veneer Association:

1. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood

E. National Fire Protection Association:
1. NFPA 80 - Standard for Fire Doors, Fire Windows.
2. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

F. Underwriters Laboratories Inc.:
1. UL 10B - Fire Tests of Door Assemblies.
2. UL - Building Materials Directory.

1.4 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises, bores, and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate glazing to be factory supplied...

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall include hardware installation and replacement of glass and glazing.
3. Warranty shall be in effect during the following period of time from date of Substantial Completion:

a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flush Wood Doors:

a. Algoma Hardwoods Inc. Model # SCLC-5
b. Eggers Industries; Architectural Door Division. Model # 5 ply -SCL
c. VT Industries Inc.Model # 5508 – SCL-5
d. Marshfield Door Systems. Model # Signature Series LSL
e. Mohawk Flush Doors, Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that contain no added urea formaldehyde.

B. Doors for Transparent Finish:

1. Grade: Premium, with Grade A faces.
2. Species and Cut: Maple, rift cut.
3. Match between Veneer Leaves: Slip match .
4. Assembly of Veneer Leaves on Door Faces: Balanced slip match.

2.3 SOLID-CORE DOORS

A. Cores: Comply with the following requirements:
1. Structural Composite Lumber Core: Timberstrand LSL

B. Interior Veneer-Faced Doors:

1. Construction: Five plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.4 FACTORY GLAZING

A. Furnish tempered glass conforming to CPSC 16 CFR 1201 Category II at locations where safety glass is indicated on Drawings for full vision interior doors.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining. Drill pilot holes for screws for butt hinges and lock fronts at the factory.

C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.

B. Finish doors at factory that are indicated to receive transparent finish. Factory prime and prepare for field finish doors indicated to receive opaque finish.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: Manufacturer's standard catalyzed polyurethane finish with performance comparable to AWI System. Provide two finish coats
3. Staining: As selected by Designer from manufacturer's full range. To match Architect's sample.
4. Effect: Semifilled finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed doorframes before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Section 08710 - DOOR HARDWARE.

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Protection: Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 41 13

ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

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. Exterior aluminum-framed storefronts including aluminum frames for fixed glazing and for operable sash, doors, hardware and glass.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

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 0726 00 – Vapor Retarders: perimeter vapor seal between glazing system and adjacent construction.
2. Section 07 27 00 – Air Barriers: perimeter air seal between glazing system and adjacent construction.
3. Section 07 90 00 – Joint Protection: for installation of joint sealants installed with aluminum-framed systems and for sealants to the extent not specified in this Section.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Dimensional tolerances of building frame and other adjacent construction.
4. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.

d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units to function properly.

B. Structural Loads: Wind and seismic loads not less than that required by Code.

C. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inchesand to 1/240 of clear span plus 1/4 inchfor spans greater than 13 feet 6 inchesor an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller, amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below to less than 1/8 inchand clearance between members and operable units directly below to less than 1/16 inch.

D. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg Fmaterial surfaces.

E. Air Infiltration Test: Test unit in accordance with ASTM E 283, as follows:

1. Static Air Pressure Difference: 6.24 psf for fixed storefront units, and 1.567 psf for doors.
2. Performance: Maximum air leakage shall not exceed the following: fixed storefront units, 1.0 cfm/sf.: glazed entrance door units, 0.3 cfm/sf of other areas.

F. Water Leakage Test: Test fixed framing system in accordance with ASTM E 331.

1. Test Pressure: 8 psf.
2. Performance: No leakage as defined in test method at specified test pressure. No uncontrolled water penetrating system or appearing on normally exposed interior surfaces.

G. Solar Heat-Gain Coefficient: Provide units with a whole-unit SHGC maximum as required by Code, determined according to NFRC 200 procedures. Submit proof of compliance with submittals as specified.

H. Thermal Transmittance: Provide window units that have a U-value as required by Code rated in BTU/hour/sq. ft./degrees F at 15-mph exterior wind velocity, when tested in accordance with AAMA 1503.1. Test unit to be 4 ft. x 6 ft. Submit proof of compliance with submittals as specified.

I. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 for fixed storefront units and not less than 48 for doors when tested according to AAMA 1503.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include structural analysis data signed and sealed by the qualified professional engineer registered in the Commonwealth of Massachusetts responsible for their preparation.
2. Include structural analysis of story drift and deflection from anticipated live loads, and determination whether head receptors are required.
3. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
4. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Qualification Data: For Installer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems.

F. Performance Reports: Based on systems, components and glazing methods proposed for use on this Project, proof that units as glazed for this Project meet or exceed Code requirements for the following:

1. U-value.
2. Solar heat-gain coefficient.

G. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

H. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Capable of assuming engineering responsibility and performing work of this Section and who is acceptable to manufacturer.

1. Engineering Responsibility: Preparation of data for aluminum-framed systems including Shop Drawings based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project and submission of reports of tests performed on manufacturer's standard assemblies.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Storefront, Thermal Break, 2 inch by 4-1/2 inch profile :
   a. EFCO Corporation, S-403.
   b. Kawneer, VG451T.
   c. Tubelite Inc., E14000 IO.
   d. Traco, TR-7850.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermal-break.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

E. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

F. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type

2.4 .ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: As indicated.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products products complying with BHMA standard referenced].
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
3. Opening-Force Requirements:

   a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbfto set the door in motion and not more than 15 lbf to open the door to its minimum required width.

C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in "Entrance Door Hardware Sets" Article.
2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

D. Pivot Hinges: BHMA A156.4, Grade 1.

1. Offset-Pivot Hinges: Provide top, bottom, and intermediate offset pivots at each door leaf.

E. Butt Hinges: BHMA A156.1, Grade 1, radius corner.

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
2. Exterior Hinges: Stainless steel, with stainless-steel pin.
3. Quantities:

   a. For doors up to 87 inches high, provide three hinges per leaf.
   b. For doors more than 87 and up to 120 inches high, provide four hinges per leaf.

F. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame.

G. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

H. Manual Flush Bolts: BHMA A156.16, Grade 1.

I. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.

J. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

K. Cylinders: As specified in Section 087100 "Door Hardware." BHMA A156.5, Grade 1.

1. Keying: Master key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE" to be furnished by Owner.

L. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

M. Operating Trim: BHMA A156.6.

N. Removable Mullions: BHMA A156.3, extruded aluminum.

1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.

O. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

P. Concealed Overhead Holders: BHMA A156.8, Grade 1.

Q. Surface-Mounted Holders: BHMA A156.16, Grade 1.

R. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

S. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701/702, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

T. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

U. Silencers: BHMA A156.16, Grade 1.

V. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

W. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

X.

Y.

2.6 GLAZING SYSTEMS

A. Glazing: Glazing: Select quality complying with ASTM C1036. Insulating glass IGCC certified to performance level CBA when tested in accordance with ASTM E774.
   1. Glazing Method: Tempered Insulated Glass.
   2. Glass Type: 1" thick Clear, Low E^2 , Tempered, no less than 3/16" thick lites
   3. Units are silicone glazed against panel exterior to allow re-glazing from the interior.
   4. Insulated spacer utilizes warm-edge technology.
   5. Airspace options: Argon Fill.

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

2.7 HARDWARE: Projected Windows

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals.

B. Locks and Latches: Designed to allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

C. Projected Windows: Provide the following operating hardware:
   1. Hinge: Concealed stainless steel four-bar friction hinge with adjustable-slide friction shoe; two per ventilator.
   2. Lock: One Point Lift locks, white bronze locking handle and keeper (two per ventilator.
   3. Lock: One painted zinc die cast scissor arm (roto) operator at sill and one painted zinc die cast single point lock at each jamb.

2.8 INSECT SCREENS
   1. General: Design windows and hardware to accommodate full screens at operable windows in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on inside of window. Provide insect screens on all operable sash.
   2. Aluminum Inside Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and access panel to operable window hardware.
   3. Extruded-Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.050-inch (1.3-mm) wall thickness.
   4. Finish: Match aluminum window members.
   5. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- diameter, coated aluminum wire.
   6. Wire-Fabric Finish: Charcoal gray

2.9 ACCESSORY MATERIALS

A. Insulating Materials: As specified in Section 07 21 00 - BUILDINGL INSULATION.

B. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07 90 00 - JOINT PROTECTION.

C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-milthickness per coat.

2.10 FABRICATION

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.11 ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. High-Performance Organic Finish (3-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard 3-coat, thermocured system consisting of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.

1. Color and Gloss: As selected by Designer from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Section 07 90 00 - JOINT PROTECTION and to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, without warp or rack.

F. Install glazing.

1. Structural-Sealant Glazing:

a. Prepare surfaces that will contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
b. Install weatherseal sealant according to Section 07 90 00 - JOINT PROTECTION and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

G. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet1/4 inchover total length.
2. Alignment:

   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified for laboratory testing under Part 1 "Performance Requirements" Article, but not more than 0.09 cfm/sq. ft.of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.
2. Water Penetration: Areas shall be tested according to ASTM E 1105 at a minimum cyclic static-air-pressure difference of 0.67 times the static-air-pressure difference specified for laboratory testing under Part 1 "Performance Requirements" Article, but not less than 4.18 lbf/sq. ft., and shall not evidence water penetration.
3. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feetby 1 story of aluminum-framed systems designated by Designer shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 08 41 13

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SECTION 08 51 13
ALUMINUM WINOWS

PART 1 GENERAL

1.01 FILED SUB-BID REQUIREMENT

A. The Aluminum Window filed sub-bid includes the Work specified in the following Sections:
   1. 08 51 13, Aluminum Windows

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings: Cover Sheet, A-1.0, A-1.2, A-2.0, A-3.0, A-3.1, A-3.2, A-5.0, A-5.1, A-5.2, A-5.6 & A-6.0.

1.02 SUMMARY

A. Section Includes:
   1. All exterior Architectural Performance Class (AW) windows furnished and installed as shown on drawings, specified in this section and designated in AAMA/WDMA/CSA 101/I.S.2/A440-2011 North American Fenestration Standard (NAFS-2011).
   2. All labor, materials, tools, equipment and services needed to furnish and install AW Class windows.
   3. Components furnished with installed windows.
   4. Installation accessories furnished and installed.

1.03 REFERENCES

A. Refer to NAFS-2011 for a complete list of references and industry standards.

1.03 SYSTEM DESCRIPTION AND PERFORMANCE REQUIREMENTS

A. Design Wind Loads - Allowable Stress Design (ASD)

a. The design wind pressure for the project will be: 27 psf positive and negative; 27 psf negative at corner zones
b. Per local building codes

2. All structural components, including meeting rails, mullions and anchors shall be designed accordingly, complying with deflection and stress requirements of Paragraph 1.03.B.

B. Air, Water and Structural Performance Requirements
1. When tested in accordance with cited test procedures, windows shall meet or exceed the following performance criteria, as well as those indicated in NAFS-2011 for Architectural AW Performance Class windows, Performance Grade 100 (AW100) unless otherwise noted herein.
   a. Test units shall not be smaller in either width or height than the "Gateway Test Size" specified in NAFS-2011 for AW Performance Class.
   b. "Downsize" testing to meet Optional Performance Class requirements specified herein shall not be permitted.
   c. Testing to previous, less stringent versions of NAFS shall not be acceptable.
   d. Test units shall employ manufacturer's standard sealing, lock spacing and anchorage.
2. Air Test Performance Requirements
   a. Air infiltration maximum 0.1 cfm per square foot at 6.24 psf pressure differential when tested in accord with ASTM E283.
3. Water Test Performance Requirements
4. No uncontrolled water leakage at 15.00 psf static pressure differential, with water application rate of 5 gallons/hr/sq ft when tested in accord with both ASTM E331 and ASTM E547. Static water test shall be repeated after application of design test pressures. Structural Test Performance Requirements
   a. Uniform Load Deflection Test
      i. No deflection of any unsupported span L of test unit (framing rails, muntins, mullions, etc.) in excess of L/175 at both a positive and negative load of 100 psf (design test pressure) when tested in accord with ASTM E330.
   b. Uniform Load Structural Test
      i. Unit to be tested at 1.5 x design test pressure, both positive and negative, acting normal to plane of wall in accord with ASTM E330.
      ii. No glass breakage; permanent damage to fasteners, hardware parts, or anchors; damage to make windows inoperable; or permanent deformation of any main frame or ventilator member in excess of 0.2% of its clear span.

C. Life Cycle Testing
1. When tested in accordance with AAMA 910-10, there is to be no damage to fasteners, hardware parts, support arms, activating mechanisms or any other damage that would cause the window to be inoperable at the conclusion of testing.
   a. Air infiltration and water resistance tests shall meet the primary performance requirements specified after completion of 4000 operational cycles plus thermal cycling.
   b. Testing to previous, less stringent versions of AAMA 910 shall not be acceptable.

D. Condensation Resistance and Thermal Transmittance Performance Requirements

1. Perform thermal tests in accordance with NFRC 102 and/or AAMA 1503, or provide finite element computer thermal modeling and calculations per NFRC 100, NFRC 705 or AAMA 507, using DOE/LBL THERM, WINDOW, and/or CMAST software.

a. Thermal Transmittance (U-Factor) for the overall window area shall be less than or equal to .44 BTU/hr-ft^2-°F.

b. Condensation Resistance Factor (CRF) requirements: CRF minimum .62 (Frame) and CRF minimum .56 (Glass).

E. Acoustic Performance Requirements
1. Perform acoustical tests in accordance with ASTM E90 and ASTM E1425 on the glass type(s) specified in 08 80 00, rigidly supported in aluminum framing of the same product type.
2. "Glass-only" test results shall not be acceptable.
3. Sound Transmission Class (STC) shall not be less than 31.
4. Outdoor-Indoor Transmission Class (OITC) shall not be less than 25.

1.04 SUBMITTALS

A. General Requirements
1. Provide all submittals in a timely manner to meet the required construction completion schedule.

B. Shop Drawings
1. Shop drawings must be prepared wholly by the window manufacturer, or a qualified engineering services firm under the guidance of the manufacturer. Shop drawings for pre-engineered configurations may be prepared by installers upon written manufacturer consent.
2. Provide design details along with bid proposals to define system aesthetic and functional characteristics.
3. Provide up to three photocopied sets of shop drawings, including half size details of all necessary conditions.

C. Samples
1. Components: Submit samples of anchors, fasteners, hardware, assembled corner sections and other materials and components as requested by Architect.
2. Finish: Submit color samples for Architect's approval as requested.

D. Test Reports and Calculations
1. Submit certified independent laboratory test reports verifying compliance with all test requirements of 1.03.
2. Submit structural calculations indicating adequacy of all materials furnished under this section, in meeting the uniform and structural load requirements as specified in 1.03A.

1.05 QUALITY ASSURANCE

A. Qualifications: Upon request, the window manufacturer shall provide written consent for the installation subcontractor to install window products to be used on this project.

B. In-Plant Testing: Conduct detailed quality audits and ASTM E331 static water infiltration testing on a minimum of 4% of factory-glazed windows prior to shipping, subject to reasonable unit size restrictions.
1. Each tested unit shall be identified with a removable sticker on the inside glass face.
2. Provide detailed documentation of in-plant testing upon request.

1.06 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling and Unloading
   1. Materials will be packed, loaded, shipped, unloaded, stored and protected in accordance with AAMA CW-10.

1.07 WARRANTY

A. Aluminum Window Warranty
   1. Products: Submit a written warranty, executed by the window manufacturer, for a period of ___ *(up to 10)* years from the date of manufacture, against defective materials or workmanship, including substantial non-compliance with applicable specification requirements and industry standards, which result in premature failure of the windows, finish, factory-glazed glass, or parts, outside of normal wear.
   2. In the event that windows or components are found defective, manufacturer will repair or provide replacement material without charge at manufacturer's option.
   3. Warranty for all components must be direct from the manufacturer (non pass-through) and non pro-rated for the entire term. Warranty must be assignable to the non-residential owner, and transferable to subsequent owners through its length.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer
   1. Drawings and specification are based on:
      a. Wausau Window and Wall Systems 4250i INvent Series Thermal Fixed, Projected and/or Casement Windows.
      b. Base bid will be Wausau Window and Wall Systems.
   2. Substitutions
      a. EFCO, Wausau and other manufacturers' products that meet or exceed specified design requirements may be considered. Submit the following information with request for substitutions.
         i. Test reports specified in 1.03.
         ii. Full proposal details and samples specified in 1.04.
         iii. Copy of manufacturer's warranty specified in 1.07.
         iv. Proof of at least 10 years experience in the design and fabrication of AW Performance Class windows.
         v. Other information as requested for evaluation
   3. Substitute products not approved by the Architect via addenda will not be considered.

2.02 MATERIALS

A. Aluminum Framing Members
   1. Extruded aluminum billet, 6063-T5 or T6 alloy for primary non-radius components; 6063-T5 or T6, 6005-T5, 6105-T5 or 6061-T6 for anchor components; all meeting the requirements of ASTM B221.
   2. Aluminum sheet alloy 5005-H32 (for anodic finishing), or alloy 3003-H14 (for painted or unfinished sheet) meeting the requirements of ASTM B209.
   3. Principal window frame and sash ventilator members will be a minimum 0.125" in thickness at hardware mounting locations.
   4. Extruded or formed trim components will be a minimum 0.060" in thickness.
   5. Frame depth *4 ½*" minimum.
   6. Sash ventilator sections must be tubular, and close flush with adjoining frame surfaces at interior and exterior.

a. Overlap sash ventilators will not be accepted.

2.03 COMPONENTS

A. Hardware *(Select from options as noted)*
   1. All steel components including attachment fasteners to be stainless steel except as noted.
   2. Extruded aluminum components 6063-T5 or -T6.
   3. Locking handles, bases and strikes to be die cast, white bronze or stainless steel in manufacturer's standard surface finish.
   4. Thermo-plastic or thermo-set plastic caps, housings and other components to be injection-molded nylon, extruded PVC, or other suitable compound.
   5. Hardware to be occupant-operated and include: *: stainless steel four-bar hinges, extruded aluminum butt hinges, locking cam handles, keepers, two-point keepers, linear operators, single-handle multi-lock, roto- operators, concealed friction adjusters, concealed limited opening devices.*

B. Sealants
   1. All sealants shall comply with applicable provisions of AAMA 800 and/or Federal Specifications FS-TT-001 and 002 Series.
   2. Frame joinery sealants shall be suitable for application specified and as tested and approved by window manufacturer.

C. Glass
   1. Provide in accordance with Section 08 80 00.
   2. Sealed insulated glass shall be tested and certified in accord with ASTM E2190.

D. Glazing
   1. Provide in general accordance with Section 08 80 00.
   2. Glazing method shall be in general accordance with the GANA Glazing Manual for specified glass type, or as approved by the glass fabricator.

E. Glazing Materials
   1. Setting Blocks/Edge Blocking: Provide in sizes and locations recommended by GANA Glazing Manual. Setting blocks used in conjunction with soft-coat low-e glass shall be silicone.
   2. Back-bedding tapes, expanded cellular glazing tapes, toe beads, heel beads and cap beads shall meet the requirements of applicable specifications cited in AAMA 800.
   3. Glazing gaskets shall be non-shrinking, weather-resistant, and compatible with all materials in contact.
   4. Structural silicone sealant where used shall meet the requirements of ASTM C1184.
   5. Spacer tape in continuous contact with structural silicone shall be tested for compatibility and approved by the sealant manufacturer for the intended application.
   6. Gaskets in continuous contact with structural silicone shall be extruded silicone or compatible material.

F. Steel Components
   1. Provide steel reinforcements as necessary to meet the performance requirements of 1.03.
   2. Concealed steel anchors and reinforcing shall be factory painted after fabrication with TGIC powder coating, or rust-inhibitive primer complying with Federal Specification TT-P-645B.

G. Panning:
   1. Panning shall be pre-assembled and all joinery back sealed prior to installation.
   2. Finish to match window frames.

H. Receptors
   1. Provide extruded aluminum receptors to receive windows, as shown on architectural drawings.
   2. Finish to match window frames.

I. Insect Screens:
   1. Tubular extruded aluminum frames shall meet the requirements of ANSI/SMA 1004.
   2. Screen frame finish to match window frames.
   3. Aluminum cloth shall comply with GSA-FS-RR-W-365 and USDC-CS-138 with 18 x 16 mesh.
   4. Cloth mesh color shall be bright mesh.

J. Dual Glazed Access Panel:
   1. Hinged access panel provided with Allen hex locks for custodial operation.
   2. Finish to match window frames.

2.04 FABRICATION

A. General:
   1. Finish, fabricate and shop assemble frame and sash ventilator members into complete windows under the responsibility of one manufacturer.
   2. No bolts, screws or fastenings shall impair independent frame movement, or bridge the thermal barrier, unless such bridging was also present in thermal test units and thermal models.
   3. Fabricate to allow for thermal movement of materials when subjected to a temperature differential from -30 °F to +180 °F.

B. Frames:
   1. Cope and mechanically fasten each corner, or miter and weld, or corner block each corner; then seal weather tight.
   2. Make provisions for continuity of frame joinery seals at extrusion webs.

C. Main Sash Ventilator
   1. Miter all corners and mechanically stake over a solid extruded aluminum corner block, set and sealed in epoxy, leaving hairline joinery, then sealed weather tight.
   2. Make provisions for continuity of sash ventilator joinery seals at extrusion webs.

D. Glass Drainage: (field glazed units only)
   1. Provision shall be made to insure that water will not accumulate and remain in contact with the perimeter area of sealed insulating glass.

E. Hardware:
   1. Concealed Hinges
      a. Provide two stainless steel concealed four-bar adjustable friction hinges per vent meeting AAMA 904.1.
   2. Locks
      a. Stainless steel cam locks, strikes and/or keepers for manual operation shall secure sash in closed position.
      b. Provide locks for ventilators at maximum 40" spacing; 50″ for single operator multi-lock hardware.
      c. Provide double grip hardware activated by a lower device for locks exceeding 6'-0" from floor.
   3. Limited Opening Device

a. Provide concealed device to limit initial sash operation to 4"
b. Operation past this point to be by use of a tool or removable key.

4. Exposed Hinges
   a. Provide two (2) five-knuckle aluminum nylon-bushed hinges with coated stainless steel pins.
   b. Provide three (3) hinges on units over 4'-0" high.
   c. Finish of extruded aluminum hinge leaves and covers shall match window finish.

F. Dual Glazed Access Panel *(Optional)*
   1. Hinged access panel will be constructed with mitered corners, mechanically staked over a solid aluminum corner block leaving hairline joinery.

G. Thermal Break Construction:
   1. Continuous extruded polyamide with 25% glass fiber reinforcing, mechanically crimped into cross-knurled cavities.
   2. Minimum thermal barrier width 24 mm.
   3. Quality assurance records must be maintained and available as requested.

H. Weather-stripping:
   1. Bulb- or fin-type neoprene, EPDM, dual-durometer PVC, polypropylene, TPE, or other suitable material as tested and approved by the window manufacturer.
   2. Miter, crowd, stake or join at corners. Provide drainage to exterior as necessary.
   3. Weather-stripping shall provide an effective pressure-equalization seal at the interior face of the sash ventilator.

2.05 FINISHES

A. Finish of Aluminum Components
   1. Finish of all exposed areas of aluminum windows and components shall be done in accord with the appropriate AAMA Voluntary Guide Specification shown *(Select from below).*

Designation	Description	Standard	Color
AAM10C21A41	Clear Class I Eco-friendly etch	AAMA 611	Clear
AAM10C21A44	Electrolytically Deposited Class I Eco-friendly etch	AAMA 611	Champagne, Light Bronze, Medium Bronze Dark Bronze, Extra Dark Bronze, Black, or Copper Anodize
Interior Paint	50% PVDF, Enamel, Acrylic or Polyester	AAMA 2603	*As selected by Architect* Suitable for INTERIOR finishes
Exterior Paint	70% PVDF	AAMA 2605	*As selected by Architect* Suitable for INTERIOR or EXTERIOR finishes

PART 3 EXECUTION

3.01 EXAMINATION

A. Site Verification of Conditions
   1. Verify that building substrates permit installation of windows according to the manufacturer's instructions, approved shop drawings, calculations and contract documents.
   2. Do not install windows until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Erection of Aluminum Windows
   1. Install all windows with skilled workers in accordance with approved shop drawings, installation instructions, specifications, and the AAMA Commercial Window and Door Installation Manual.
   2. Vent windows must be installed, and remain, plumb, square and level, to one-half of the unit shimming tolerances cited in the AAMA Commercial Window and Door Installation Manual, for proper weathering and operation.
   3. Aluminum that is not organically coated shall be insulated from direct contact with steel, masonry, concrete or other dissimilar metals by bituminous paint, rust-inhibiting primer, non-conductive shims or other suitable insulating material.

SECTION 08 62 00

UNIT SKYLIGHTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 REFERENCE STANDARDS

A. ASTM D 542: Standard Test Method for Index of Refraction of Transparent Organic Plastics

B. ASTM D 632: Standard Specification for Sodium Chloride

C. ASTM D 635: Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

D. ASTM D 638: Standard Test Method for Tensile Properties of Plastics

E. ASTM 695: Standard Test Method for Compressive Properties of Rigid Plastics

F. ASTM 790: Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

G. ASTM D 1003: Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics

H. ASTM D 1929: Standard Test Method for Determining Ignition Temperature of Plastics

I. ASTM D 2843: Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics

1.3 SUMMARY

A. This Section includes the following:
   1. Self—Flashed plastic skylight with integrated curb.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Section 06 10 00– Miscellaneous Rough Carpentry: for wood support curbs and wood framing for rough opening.
   2. Section 07 26 00 – Vapor Retarders: for sealing roof vapor retarder at penetrations.

3. Section 07 62 00 – Sheet Metal Flashing and Trim: for skylight counterflashing.
4. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Refer to roofing system Sections for roofing accessories to be built into the roofing system to accommodate Work of this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide unit skylights capable of withstanding loads indicated without failure. Failure includes the following:
1. Thermal stresses transferred to the building structure.
2. Framing members transferring stresses, including those caused by thermal and structural movement, to glazing.
3. Noise or vibration created by thermal and structural movement and wind.
4. Loosening or weakening of fasteners, attachments, and other components.
5. Sealant failure.

1.5 SUBMITTALS

A. Product Data: For each type of skylight specified, including details of construction relative to materials, dimensions of individual components, profiles, finishes, and glazing light transmission and thermal characteristics.

B. Shop Drawings: Show fabrication and installation of skylights, including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Samples for Selection: Manufacturer's color charts showing a full range of colors available for each type of skylight glazing, retainer, frame, and curb indicated.

1.6 DELIVERY, HANDLING, STORAGE

A. Deliver products in manufacturer's original containers dry, undamaged, seals and labels intact.

B. Store and protect products in accordance with manufacturer's recommendations.

1.7 QUALITY ASSURANCE

A. Thermal response characteristics: Provide plastic sheet identical to those tested for the following thermal performance test:
1. Heat distortion temperature when tested per ASTM D 648 of at least 200 deg F

1.8 WARRANTY

A. General: Warranties specified in this Section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and

shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Skylight Warranty: Provide written warranty signed by manufacturer, agreeing to repair or replace work that exhibits defects in materials or workmanship and guaranteeing weathertight and leak-free performance.
   1. Warranty Period: 5 years from date of Substantial Completion.

C. Plastic Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work that has or develops defects in the plastic.
   1. Warranty Period for Acrylic: 5 years from date of Substantial Completion against yellowing.

D. Finish Warranty: Provide written warranty signed by manufacturer agreeing to repair or replace work with finish defects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following or approved substitute.
   1. VELUX America, Inc.

B. Substitutions: Other manufacturers shall be considered and must submit to the Architect the following:
   1. List of similar projects successfully completed within the last five years.
   2. Complete details of proposed skylight.
   3. Complete specifications for Architect's review.

2.2 MATERIALS

A. Extruded aluminum retaining angle. Extruded aluminum allow 6063-T5 with minimum effective thickness of 0.055 inch. Mitered and welded corner assembly in mill finish.

B. Extruded aluminum inner frame with integral condensation gutter. Extruded aluminum alloy 6063-T5 with minimum effective thickness of 0.055 inch unless noted. Mitered and welded corner assembly in mill finish.

C. Integral Curbs: Fabricate from double skin of aluminum, insulated with 1 inch of polyisocyanurate insulation R-6 / U factor .167). Provide thermal break at top and bottom.
   1. Provide 0.025 inch (0.6 mm) inner skin and 0.032 inch outer skin.

D. Double-sided very high bond adhesive closed cell foam tape glazing seal.

E. Plastic Sheets: Monolithic, formable, transparent sheets with good weather and impact resistance. Glazing seal with back beaded dow silicone.
   1. Acrylic inner and outer dome

2. ASTM D-1003 light transmittance of 91% for clear acrylic
3. ASTM D-542: reflective index of 1.49
4. ASTM D-638: Tensile strength – rupture 10.2K PSI / Elasticity 450K PSI
5. ASTM D-790: Flexural strength: -Rupture 15K PSI / Elasticity 450K PSI
6. Thermo-formable. Type UVA (formulated with ultraviolet absorber)

F. Fasteners: 8x1 stainless steel – hex washer head, provided by installer. Skylight assembly fasteners zinc electroplated.

G. Thermal-break optional unless otherwise noted. ½" polyurethane thermal break.

2.3 PLASTIC SKYLIGHT UNITS

A. General: Factory-assembled, curb-mounted unit consisting of plastic glazing, gasketing, inner frame that is incorporated into the curb, and integral curb with self-contained roof flashing flanges. The insulated curb height shall be 9" as specified and contain 1" thick polyisocyanurate structural foam with fiberglass reinforced faces meeting factory mutual class-1 and Underwriter's laboratory class A approval. The roof mounting flange shall be 3 inches.
1. Products: CAP-3 (hip-ridge).

B. Condensation Control: Fabricate skylight units with integral internal gutters and nonclogging weeps to collect and dispose of condensation.

C. Thermal Break: Fabricate skylight units with thermal barrier separating interior metal framing from materials exposed to outside temperature.

D. Size: See Schedule.

E. Glazing:
1. Thermoformed acrylic.
   i. CAP-3 Profile: Hip-Ridge outer glazing and dome inner glazing
      1. Inner Glazing Color: Colorless, transparent acrylic.
      2. Outer Glazing Color: Colorless, transparent acrylic.

2.4 ACCESSORIES

A. NOT USED

2.5 FABRICATION

A. Framing Components: As follows:
1. Factory fit and assemble components.
2. Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.
3. Fabricate components to drain water passing joints and to drain condensation and moisture occurring or migrating within skylight system to the exterior.
4. Fabricate components to accommodate expansion, contraction, and field adjustment, and to provide for minimum clearance and shimming at skylight perimeter.

5. Fabricate components to ensure that glazing is thermally and physically isolated from framing members.
6. Form shapes with sharp profiles, straight and free of defects or deformations, before finishing.
7. Fit and secure joints by heliarc welding.

2.6 ALUMINUM FINISHES

A. Mill Finish: Manufacturer's standard satin mill finish. Unless otherwise noted.

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 skylight performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Metal Protection: As follows:
   1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
   2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
   3. Where aluminum will contact pressure-treated wood, separate dissimilar materials by methods recommended by manufacturer.

3.3 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing skylight components.

B. Coordinate with installation of roof deck and other substrates to receive skylight units.

C. Coordinate with installation of vapor barriers, roof insulation, roofing, and flashing as required to assure that each element of the work performs properly and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

3.4 CLEANING AND PROTECTION

A. Clean exposed metal and plastic surfaces according to manufacturer's instructions. Touch up damaged metal coatings.

B. Clean and polish plastic skylight units, inside and out, not more than 5 days prior to date of substantial completion.

END OF SECTION

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SECTION 08 71 00

DOOR HARDWARE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Commercial door hardware.
2. Cylinders for doors specified in other Sections as listed below.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Furnish the following items for installation by the designated Sections: Not Applicable

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

1. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES for standard doors and fire rated doors.
2. Section 08 14 16 - FLUSH WOOD DOORS for standard doors and fire rated doors.

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware.
g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: Prepared by or under the supervision of supplier, detailing the final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article.

1. Include lists of completed projects with project names and addresses of architects and owners, and other information specified.

F. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 01.

G. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Designer, and the Lexington Public Facilities Project Manager about door hardware and keying.

C. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with Massachusetts Architectural Access Board and the Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:

   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:

      1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
      3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

   c. Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:

   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
   b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
   c. Thresholds: Not more than 1/2 inch high.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to electrified door hardware including, but not limited to, the following:
1. Review sequence of operation for each type of door hardware.

2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to manufacturer of key control system.

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the Town of Lexington Project Manager of other rights the Town of Lexington Project Manager may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of operators and door hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

C. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

D. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for the Middleborough Housing Authority continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Scheduled and acceptable manufacturers must provide all the functions and features of the specified product or it will not be approved.

Item	Scheduled Manufacturer	Acceptable Manufac-turers
Hinges	Ives (IVE)	McKinney, Hager
Locksets & Deadlocks	Sargent	Sargent
Cylinders & Keying	Sargent	Sargent, Best (Owner Supplied)
Door Closers & Auto Operators	LCN (LCN)	Norton
Push & Pull Plates & Bars	Ives (IVE)	Rockwood, Burns
Flush Bolts & Coordi-nators	Ives (IVE)	Rockwood, Burns
Protection Plates	Ives (IVE)	Rockwood, Burns
Stops & Holders	Ives (IVE)	Rockwood, Burns
Silencers	Ives (IVE)	Rockwood, Burns
Thresholds & Weather-strip	National Guard (NGP)	Pemko, Reese

B. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

C. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.2 MATERIALS

A. Fasteners:

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely.

4. All hardware shall be installed with the fasteners provided by the hardware manufacturer.

B. Hinges:

1. The following is a guide for hinge type required for this specification:
   a. 1-3/4" thick doors up to and including 3'-0" wide:
      1) Exterior: standard weight, ball bearing, bronze/stainless steel, 4-1/2" high
      2) Interior: standard weight, ball bearing, steel, 4-1/2" high
   b. 1-3/4" thick doors over 3'-0" wide:
      1) Exterior: heavy weight, ball bearing, bronze/stainless steel, 5" high
      2) Interior: heavy weight, ball bearing, steel, 5" high
2. Provide 3 hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Interior Doors: Non-rising pins
4. The width of hinges shall be 4-1/2" or as required for clearance.

C. Locks:

1. Cylindrical (Bored) locks shall be certified as ANSI A156.2, Series 4000 Grade 2 Operational, and shall be manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock shall be multi-function and field reversible for handing without opening the case.
2. Locks are to have a standard 2-3/4" backset with a full 3/4" throw 2-piece stainless steel mechanical anti-friction latch bolt.
3. Exposed trim shall be stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning. Lever design shall be Schlage Neptune (NEP) or similar.
4. Locks meeting this specification: Sargent 60-28-10G38 x LL Classroom Security. Classroom Locksets to allow for Sargent Large Format IC core on outside and Best core on inside (owner supplied cores.

D. Exit Devices:

1. Exit devices shall be touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
2. All exit devices shall incorporate a fluid damper or other device which eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US32D finishes. Only compression springs will be used in devices, latches, and outside trims or controls.
3. All devices to incorporate a security dead latching feature.

4. Provide roller strikes for all rim and surface mounted vertical rod devices, ASA strikes for mortise devices, and manufacturer's standard strikes for concealed vertical rod devices.
5. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
6. All non-fire-rated exit devices shall have cylinder dogging.
7. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set. Lever style will match the lever style of the locksets.
8. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
9. Provide electrical options as scheduled.
10. Exit devices meeting this specification: Von Duprin 98 series, Precision Apex series, Sargent 80 series with dead latching.
    a. Surface mounted, stainless steel (US32D finish), push pad device, top and bottom vertical rods and latches. UL listed for Panic Hardware; ANSI A156.3 – 2001 Grade 1.
    b. Von Duprin 98/99 Series Surface Mounted Vertical Rod Device.
    c. Models:
        1) Right Hand Reverse Swing: 9827-L-NL-06-3'-US32D-RHR
        2) Left Hand Reverse Swing: 9827-L-NL-06-3'-US32D-LHR
    d. Options
        1) CD – cylinder dogging as required by owner.
        2) RG – rod guards at all bottom rods, surface mounted

E. Strikes shall coordinate with door frames and latching hardware.

F. Door Closers:

1. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron or cast aluminum cylinder. Cylinder body shall be 1-1/2" in diameter, and double heat-treated pinion shall be 11/16" in diameter.
2. Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
3. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and back check.
4. All closers shall have solid forged steel main arms (and forged forearms for parallel arm closers).
5. Closers shall not incorporate a pressure relief valve.
6. All closers shall have metal covers.
7. Closer cylinders, arms, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing by an independent testing laboratory used by BHMA for ANSI certification. For metal components that can't be powder coated, a special rust inhibiting finish (SRI) must be used.
8. Door closers meeting this specification: LCN 4010/4110 series, Norton 7500/PR7560 (standard screws).

G. Push Plates: 8" wide x 16" high x 0.050" thick. Where door stile does not allow 8" wide plates, 4" wide plates may be used.

H. Door Pulls & Push Bars: Solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile.

I. Coordinators
   1. Ives model COR9G or equivalent
      a. Surface mounted, gravity type

J. Protection Plates: Provide kick plates as scheduled, with 4 beveled edges. Furnish with machine or wood screws, finished to match plates. Plates shall be 8" high x 2" LWOD on single doors, 1" LWOD on pairs of doors.

K. Door Stops and Holders:

   1. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements:
      a. Wall stops shall be used wherever possible.
      b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
      c. At any opening where a wall or floor stop cannot be used, a heavy-duty overhead stop must be used.

L. Thresholds and Weatherstrip: Furnish as scheduled and per architectural details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available.
   1. National Guard
      a. Nylon brush in aluminum channel.
      b. Sizes necessary for full perimeter including door sweeps, jambs, heads and astragal.
   2. Thresholds – National Guard or equal
      a. Saddle Thresholds – 1/2 inch high x jamb width x door width
      b. Model 424E with vinyl foot seal or equivalent

M. Silencers: "Push-in" type silencers for each hollow metal or wood frame, 3 for each single frame, 2 for each pair frame. Omit where gasketing is scheduled.

2.3 FINISHES

A. With the exception of all items listed below, the finish of all hardware shall be US26D - satin chrome or US32D - satin stainless steel.

B. Exceptions are as follows:
   1. Door Closers - aluminum powder coat finish.
   2. Coordinators - prime painted.
   3. Thresholds - mill finish aluminum.
   4. Weatherstrip & Sweeps - clear anodized aluminum.
   5. Silencers - grey.

2.4 KEYING

A. All locks and cylinders shall be supplied with construction cores. Permanent cores will be supplied by Owner.

B. All locks and cylinders shall be Sargent Large Format interchangeable core type.

C. Provide 6 construction master keys.

D. All master keys shall be delivered directly to the Owner by the hardware supplier, who shall obtain a receipt for delivery of same.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.

1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.3, "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. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

D. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings. Verify location with Designer.

1. Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.

E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 079200 - JOINT SEALANTS.

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:

1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
2. Consult with and instruct the Town of Lexington Project Manager's personnel on recommended maintenance procedures.
3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 Schedule

A. The following hardware sets are intended to establish type and standard of quality when used together with this section requirement. Examine Drawings and Specifications and furnish proper hardware for door openings.

1. Hardware Set A: Classroom
   Hinges: Full mortise hinges as specified 11/2 pair.
   Lock: Bored Lock, Key Lock outside, inside always open with latch (ANSI F04) with mechanical lock.
   Kickplates: 10 inch high, both sides.
   Door Stop: Wall stop.

2. Hardware Set B: Storage, Non-Fire Rated
   Hinges: Full mortise hinges as specified 11/2 pair.
   Lock: Bored Lock, Outside key unlock, inside always open with latch (ANSI F07).
   Kickplates: 10 inch high, pull sides.
   Door Stop: Wall stop.

3. Hardware Set C: Lavatories, Single
   Hinges: Full mortise hinges as specified 11/2 pair.
   Lock: Bored Lock, inside turn lock, release when latch turned (ANSI F22).
   Closer: Surface mounted as specified.
   Kickplates: 10 inch high, both sides.
   Door Stop: Floor dome stop.

4. Hardware Set D: Lavatories, Multi-fixture
   Hinges: Full mortise hinges as specified 11/2 pair.
   Lock: Not applicable.
   Closer: Surface mounted as specified.
   Kickplates: 10 inch high, both sides.
   Door Stop: Floor dome stop.
   Push Plate: 6 inch wide by 16 inch tall, stainless.
   Pull: ADA compliant loop pull.

5. Hardware Set E: Supply Closet (single) Locking
   Hinges: Full mortise hinges as specified 11/2 pair.
   Lock: Bored Lock, Key Lock outside, inside always open with latch (ANSI F04).
   Kickplates: 10 inch high, both sides.
   Holder Surface mounted as specified.
   Door Stop: Wall stop.

6. Hardware Set F: Supply Closet (pair) Locking
   Hinges: Full mortise hinges as specified 11/2 pair each door.
   Lock: Bored Lock active, dummy trim and strike on passive door
   Flushbolt: Passive Door
   Kickplates: 10 inch high, pull side.
   Holder Surface mounted as specified.
   Door Stop: Wall stop.

7. Hardware Set G: Exit Door Pairs

Hinges: Full mortise hinges as specified 11/2 pair each door.
Latchset: Von Duprin specified or equal
Closer: surface mounted
Lock: mortised, coordinate keying with owner.
Strikes: Von Duprin
Coordinators: Ives
Threshold: National Guard
Kickplates: 8 inch high, pull side.
Weatherstripping: National Guard; at all exterior doors
Door Stop: Wall stop at interior doors, floor stop at exterior doors

.

END OF SECTION

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.027 inch.
b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.025 inch.
b. Depth: As indicated on Drawings.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.027 inch .

E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.033 inch.
2. Depth: 1-1/2 inches.

G. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.

1. Depth: 3/4 inch.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch- diameter wire.

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.
2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
4. 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. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. 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.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

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SECTION 09 29 00

GYPSUM BOARD

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 gypsum board at walls, soffits and ceilings
2. Tile backing panels at areas to receive tile finish.

B. Alternates: Add Alternate #1 Alterations and Reconfiguration of the Main Office

C. Related Requirements:
1. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD 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 paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. 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.

B. Low-Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying 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."

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

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. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum.
b. CertainTeed Corp.
c. Georgia-Pacific Gypsum LLC.
d. Lafarge North America Inc.
e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple-Inland.
h. USG Corporation

B. Wall Board Type:

1. Basis-of-Design Product: G-P Gypsum Paperless
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

C. Fire-Resistant, Type X:

1. Basis-of-Design Product: G-P Gypsum; "DensArmor Plus Fireguard Paperless Interior Panel."
2. Thickness: 5/8 inch.
3. Long Edges: Tapered.

D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Basis-of-Design Product: G-P Gypsum.
2. Thickness: 5/8".
3. Long Edges: Tapered.

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Basis-of-Design Product: G-P Gypsum "Dens Armor Plus.
2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

F. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 2.
1. Basis-of-Design Product: G-P Gypsum "Dens Armor Plus Abuse Resistant.
2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
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G. Cementitious Backer Board: ANSI A118.9; High density, glass fiber reinforced, at all areas to receive ceramic tile.
   1. 5/8 inch thick;
   2. 2 inch wide coated glass fiber tape for joints and corners.

2.4 EXTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   1. American Gypsum.
   2. CertainTeed Corp.
   3. Georgia-Pacific Gypsum LLC.
   4. Lafarge North America Inc.
   5. National Gypsum Company.
   6. PABCO Gypsum.
   7. Temple-Inland.
   8. USG Corporation.

B. Exterior Wall Board Type:

   1. Basis-of-Design Product: G-P Gypsum; "DensGlass Gold Exterior Sheathing"
   2. Thickness: 5/8 inch at link
   3. Long Edges: Tapered.

C. Acoustically Enhanced Gypsum Board: ASTM C 1396/C 1396M. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.

   1. Products: Subject to compliance with requirements of the partition schedule.

      a. National Gypsum Company; Sound Break.
      b. Quiet Solution, Quiet Rock.

   2. Core: 5/8 inch, regular type
   3. Long Edges: Tapered.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc

   2. Shapes:
      a. Cornerbead.
      b. L-Bead: L-shaped; exposed long flange receives joint compound.
      c. U-Bead: J-shaped; exposed short flange does not receive joint compound.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: 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 setting-type taping compound.

   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Laminating adhesive 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. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements of the partition schedule:

a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
b. Grabber Construction Products; Acoustical Sealant GSC.
c. Pecora Corporation; AC-20 FTR.
d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
e. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Acoustical joint sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, 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 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. 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.

C. 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.

D. Form control and expansion joints with space between edges of adjoining gypsum panels.

E. 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.

F. 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.

G. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

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.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings.
3. Ceiling Type: As indicated on Drawings.
4. Abuse-Resistant Type: As indicated on Drawings.
5. Acoustically Enhanced Type: As indicated on Drawings.

B. 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 vertically (parallel 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.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant 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. L-Bead: Use where indicated.
3. U-Bead: Use at exposed panel edges where indicated.

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, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture[matching approved mockup and] free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. 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 092900

SECTION 09 30 13
TILING
(FILED SUB-BID REQUIRED)

PART 1 GENERAL

1.1 FILED SUB-BID REQUIREMENT

A. The Tiling filed sub-bid includes the Work specified in the following Sections:
   1. 09 30 13, Tiling

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings: Cover Sheet, A-1.0, A-1.2, A-1.6, A-1.7, A-4.0, A-4.3 & A6.0

1.2 SUMMARY

A. Section includes ceramic and porcelain tile for interior floor and wall applications and cementitious backer board as tile substrate.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Related Sections:
   1. Division 1 – General Conditions
   2. Section 07 90 00 – Joint Protection
   3. Section 09 29 00 – Gypsum Board: Wall substrate.
   4. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office

1.3 REFERENCES

A. American National Standards Institute:
   1. ANSI A108.1 - Installation of Ceramic Tile, A collection.
   2. ANSI A108.10 - Specifications for Installation of Grout in Tilework.

3. ANSI A108.1A - Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
4. ANSI A108.1B - Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
5. ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
6. ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
7. ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
8. ANSI A108.7 - Specifications for Electrically Conductive Ceramic Tile Installed with Conductive Dry-Set Portland Cement Mortar.
9. ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
10. ANSI A118.4 - Latex-Portland Cement Mortar.
11. ANSI A118.6 - Ceramic Tile Grouts.
12. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
13. ANSI A118.9 - Test Methods and Specifications for Cementitious Backer Units.
14. ANSI A136.1 - Organic Adhesives for Installation of Ceramic Tile.
15. ANSI A137.1 - Ceramic Tile.

B. ASTM International:
1. ASTM C847 - Standard Specification for Metal Lath.

C. Tile Council of North America:
1. TCNA - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

A. Shop Drawings: Indicate patterned applications and thresholds.

B. Product Data: Submit instructions for using grouts and adhesives.

C. Samples: Submit mounted tile and grout on two plywood panels, 16x16 inch in size illustrating pattern, color variations, and grout joint size variations.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with TCNA Handbook and ANSI A108.1 Series/A118.1 Series.

B. Maintain one copy of each document on site.

C. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of Project.

D. Installer: Company specializing in performing Work of this section with minimum three documented experience approved by manufacturer.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

PART 2 PRODUCTS

2.1 TILE

A. Basis-of Design Product: Dal-Tile International; Natural Hues Eco-Body Ceramic

B. Manufacturers: Products are based upon one or a multiple of manufacturers to establish a quality and design standard and is not meant to discourage competition in any way.
   1. Dal-Tile International.
   2. Stark Ceramics Incorporated
   3. American Olean Tile Co.
   4. Tilecera Inc.
   5. Substitutions: Permitted with Architect's approval under Section 01600 – Product Requirements: Product Substitution Procedures.

2.2 COMPONENTS

A. Ceramic Wall Tile: ANSI A137.1, conforming to the following:
   1. Moisture Absorption: 0 to 0.42 percent.
   2. Size: 4 ¼ x 4 ¼ x5/16 inch.
   3. Shape: Square, as indicated on plans.
   4. Edge: Cushioned.
   5. Internal Corner: Cove.
   6. External Corner: Bull nosed.
   7. Surface Finish: Matt Glazed.
   8. Styles and Colors:
      a) CT 1: Dal-Tile, Natural Hues Eco-Body, QH43 Atlantis
      b) CT 2: Dal-Tile, Natural Hues Eco-Body, QH46 Cayenne
      c) CT 3: Dal-Tile, Natural Hues Eco-Body, QH24 Ivory
      d) Refer to finish schedule in drawings for number of colors and location. Colors as selected by Architect from manufacturers standards.
   9. Pattern: Determined by Architect. Refer to finish schedule in drawings.

B. Wainscot Cap: Same as wall tile.
   1. Length: 4 1/4 inch.
   2. Height: 2 3/4 inch.
   3. Top Edge: Surface Bull nosed.
   4. Internal Corner: Cove.
   5. External Corner: Bull nosed.
   6. Surface Finish: Matte glazed.
   7. Styles and Colors:
      a) Dal-Tile, Natural Hues Eco-Body, QH08 Cinder
      b) Refer to finish schedule in drawings for number of colors and location. Colors as selected by Architect from manufacturers standards.

C. Base: Same as wall tile.
   1. Length: 4 1/4 inch.
   2. Height: 3 3/4 inch.
   3. Bottom Edge: Cove.
   4. Internal Corner: Cove.
   5. External Corner: Bull nosed.
   6. Moisture Absorption: 0 to 0.42 percent.
   7. Surface Finish: Matte glazed.
   8. Styles and Colors:
      a) CB 1: Dal-Tile, Natural Hues Eco-Body, QH43 Atlantis
      b) CB 2: Dal-Tile, Natural Hues Eco-Body, QH46 Cayenne
      c) Refer to finish schedule in drawings for number of colors and location. Colors as selected by Architect from manufacturers standards.

D. Ceramic Floor Tile: same as wall tile.
   1. Moisture Absorption: greater than 0.42 percent.
   2. Size: 12x12x5/16 inch.
   3. Shape: Square, as indicated on plans.
   4. Edge: Cushioned.
   5. Surface Finish: Matte glazed, abrasive.
   6. Styles and Colors:
      a) PCT: Dal-Tile, Natural Hues Eco-Body, QH24 Ivory Abrasive
      b) Refer to finish schedule in drawings for location. Colors as selected by Architect from manufacturers standards.
   7. Pattern: Determined by Architect. Refer to finish schedule in drawings.

E. Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above it, same size as adjoining flat tile.

F. Crack Isolation Membrane:
   1. Mapei "Aqua Defense" liquid roller applied waterproofing and crack isolation membrane.

G. Grout Materials:

1. Standard Grout: specified in ANSI A118.6; color as selected by architect.

H. Cementitious Backer Board: ANSI A118.9; High density, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

I. Thresholds: Marble type, selected color, honed finish, full width of wall or frame opening, beveled one side, radiused edges from bevel to vertical face.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
   2. Verify that concrete substrates for tile floors installed with thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
      a) Verify that surfaces that received a steel trowel finish have been mechanically scarified.
      b) Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
   3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
   4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
   5. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
   1. Tile floors in wet areas.
   2. Tile floors consisting of tiles 8 by 8 inches or larger.
   3. Tile floors consisting of rib-backed tiles.

C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
   1. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   2. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Ceramic Mosaic Tile: 1/16 inch.
   2. Quarry Tile: 3/8 inch.
   3. Glazed Wall Tile: 1/16 inch.
   4. Porcelain Tile: 3/8 inch.

H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated..

I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

J. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.

1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in modified dry-set mortar (thinset).
2. Do not extend crack isolation membrane under thresholds set in standard dry-set mortar. Fill joints between such thresholds and adjoining tile set on crack isolation membrane with elastomeric sealant.

K. Metal Edge Strips: Install [at locations indicated] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile] [where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated].

L. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 TILE BACKING PANEL INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use modified dry-set mortar for bonding material unless otherwise directed in manufacturer's written instructions.

3.5 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

3.6 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

1. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   a) Remove grout residue from tile as soon as possible.
   b) Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation.
   c) Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned.
   d) Protect metal surfaces and plumbing fixtures from effects of cleaning.

e) Flush surfaces with clean water before and after cleaning.

3.7 PROTECTION

A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

1. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces. ANSI A108.1A is wet-set method, ANSI A108.1B is cured-bed method, and ANSI A108.1C allows Contractor choice of using either method

3.8 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor

1. Ceramic Tile Installation IPCT-1 and QT-1: TCNA F131; water-cleanable, tile-setting epoxy; epoxy grout.
   a) Ceramic Tile Type: 12 x 12 Porcelain Tile and 8 x 8 Quarry Tile.
   b) Grout: Water-cleanable epoxy grout.

B. Interior Wall Installations, Masonry or Concrete:

1. Ceramic Tile Installation CT -1,2&3, PB-1, CB-1&2 and QB-1: TCNA W202; thinset mortar.
   a) Ceramic Tile Type: Ceramic Tile and Quarry Tile.
   b) Thinset Mortar: Medium-bed, modified dry-set mortar.
   c) Grout: Water-cleanable epoxy grout. Note that TCNA W223 requires smooth substrate because of thickness limitations of organic adhesives; some masonry surfaces will not be suitable.

2) Ceramic Tile Installation CT – 1, 2 & 3, PB-1, CB-1 and QB-1: TCNA W244C or TCNA W244F; thinset mortar on cementitious backer units or fiber-cement backer board.
   a) Ceramic Tile Type: Ceramic Tile and Quarry Tile.
   b) Thinset Mortar: Standard dry-set mortar.
   c) Grout: Water-cleanable epoxy grout.

END OF SECTION 09 30 13

ACOUSTICAL TILE CEILINGS
SECTION 09 51 20
(FILED SUB-BID REQUIRED)

PART 1 GENERAL

1.1 FILED SUB-BID REQUIREMENT

A. The Acoustical Tile Ceilings filed sub-bid includes the Work specified in the following Sections:
   1. 09 51 20, Acoustical Tile Ceilings

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings A-1.4, A-1.5, A-1.6. A-1.7, A-4.0, A-4.1, A-4.2, A-4.3, A-4.4, A-5.5 A-5.6, A-6.0

1.2 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Division.

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

1.3 SUMMARY

A. This Section includes acoustical tiles for ceilings and the following:
   1. Ceiling suspension systems.
   2. Return of fixtures and ceiling mounted equipment for reinstallation of new or existing.
   3. Cover plates as indicated.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Related Sections include the following:
   1. Division 1 General Requirements (All sections)
   2. Section 02 41 09 - Selective Demolition
   3. Section 09 90 00 - Painting
   4. Section 21 00 00 - Fire Protection
   5. Section 23 00 00 - HVAC
   6. Section 26 00 00 - Electrical

D. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be attached at metal deck.

1.4 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:
   1. Ceiling suspension assembly members.
   2. Method of attaching hangers to building structure.
      a. Furnish layouts for anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
   3. Size and location of initial access modules for acoustical tile.
   4. Trim for Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, pull down screens / maps and special moldings.

C. Minimum Drawing Scale: Plans: 1/8 inch = 1 foot, Details: Half Full Scale (6"=1'-0").

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Tile: Set of 12"x12" Samples of each type, color, pattern, and texture.
   2. Concealed Suspension System Members: 12-inch- long Sample of each type.
   3. Exposed Moldings and Trim: Set of 12-inch-long Samples of each type and color.

E. Maintenance Data: For finishes to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Acoustical Testing Agency Qualifications: An independent testing laboratory, or an NVLAP-accredited laboratory, with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548. NVLAP-accredited laboratories must document accreditation, based on a "Certificate of Accreditation" and a "Scope of Accreditation" listing the test methods specified.

B. Source Limitations:

1. Acoustical Ceiling Tile: Obtain each type through one source from a single manufacturer.
2. Suspension System: Obtain each type through one source from a single manufacturer.

C. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system through one source from a single manufacturer.

D. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
1. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
a. Smoke-Developed Index: 450 or less.

E. Seismic Standard: Provide acoustical tile ceilings designed and installed to withstand the effects of earthquake motions according to the following:
1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
2. The Massachusetts State Building Code.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, 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 tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

1.9 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of quantity installed.
   2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles 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 Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Engineer from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL CEILING TILE TYPES

A. Type ACT-1.
   1. Manufacturer and Model Number:
      a. Armstrong Fine Fissured
   2. Panel Size: 24 inches by 48 inches.
   3. Thickness: 15/16″ inch.
   4. Grid Face: 15/16″ Exposed Tee System
   5. Color: White
   6. Edge Detail: Square Lay-In
   7. NRC: Not less than 0.75

8. CAC: Not more than 35
9. Paint Cut Edges of Tiles

B. Type ACT-2.
1. Manufacturer and Model Number:
   a. Armstrong "Kitchen Zone"#673
2. Panel Size: 24 inches by 24 inches.
3. Thickness: 15/16" inch.
4. Grid Face: 15/16" Exposed Tee System
5. Color: White
6. Edge Detail: Square Lay-In
7. CAC: Not more than 35
8. Paint Cut Edges of Tiles

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Provide Armstrong standard 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.
1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
1. Power-Actuated Fasteners in metal deck: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

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 three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch diameter wire.

E. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.

2.5 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers:

1. Chicago Metallic Corporation.
2. Armstrong World Industries, Inc.
3. USG Interiors, Inc.

B. Extruded aluminum Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.
   1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.6 ACOUSTICAL SEALANT

A. Products:
   1. Acoustical Sealant for Exposed and Concealed Joints:
      a. Pecora Corp; AC-20 FTR Acoustical and Insulation Sealant.
      b. United States Gypsum Co.; SHEETROCK Acoustical Sealant.

B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile 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 tile ceilings.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical tile ceilings to comply with ASTM C 636 and seismic requirements of the Massachusetts State Building Code, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, post-installed mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. 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.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:
1. Follow architectural RCP.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches o.c.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 20

SECTION 09 65 00
RESILIENT FLOORING
(FILED SUB-BID REQUIRED)

PART 1 GENERAL

1.00 FILED SUB-BID REQUIREMENT

A. The Resilient Tile filed sub-bid includes the Work specified in the following Sections:
   1. 09 65 00, Resilient Flooring

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings: Cover Sheet, A-1.0, A-1.2, A-1.6, A-1.7, A-3.1, A-3.2, A-3.3, & A-6.0.

1.1 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Division.

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

1.2 SECTION INCLUDES

A. Resilient tile flooring as indicated on the drawings and schedules.

B. Resilient base.

C. Alternates: Add Alternate #1: Alterations and Reconfiguration of the Main Office

1.3 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.

1.4 DESCRIPTION OF WORK

B. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
   1. Vinyl composition tile infill and new flooring for Tasks :
      a. Reception area between desk and entrance door.

   2. Resilient wall base and accessories infill and new base for Tasks :
      a. All areas in main office called for new VCT and Carpet.

   3. Substrate preparation for resilient flooring and accessories.

C. Alternates: Not Applicable.

D. Items To Be Installed Only: Not Applicable.

E. Items To Be Furnished Only: Not Applicable.

F. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

   1. Section 02 41 09 – Selective Structure Demolition

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Manufacturers' product data for adhesives, including printed statement of VOC content

C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.

   1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.

D. Maintenance Data: For resilient products to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After post installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE

A. Vinyl Composition Tile (VCT): ASTM F 1066.

1. Armstrong World Industries, Inc.
2. Azrock Commercial Flooring, DOMCO
3. Congoleum Corporation
4. Roppe Corporation.
5. Tarkett Inc.

B. Style and Colors: Refer to finish schedule in drawings for number of colors and location.

C. Thickness: 0.125 inch

D. Size: 12 by 12 inches.

2.2 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.

1. Armstrong World Industries, Inc.
2. Azrock Commercial Flooring, DOMCO
3. Burke Mercer Flooring Products
4. Johnsonite
5. Marley Flexco (USA), Inc.
6. Nora Rubber Flooring, Freudenberg Building Systems, Inc.
7. Roppe Corporation

B. Style and Colors: Refer to finish schedule in drawings for number of colors and location. Colors as selected by Architect from manufacturers standards.

C. Type I Rubber: TS (rubber, vulcanized thermoset).

D. Shape: Coved at resilient flooring.

E. Minimum Thickness: 0.125 inch.

F. Height: 4 inches.

G. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length].

H. Outside Corners: Premolded.

I. Inside Corners: Premolded.

J. Surface: Smooth.

2.3 RESILIENT MOLDING ACCESSORY

A. Types Include the Following As Applicable: Cap for cove carpet, cap for cove resilient sheet floor covering, carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet
1. Johnsonite
2. Burke Mercer Flooring Products
3. Marley Flexco (USA), Inc
4. Roppe Corporation

B. Material: Rubber.

C. Profile and Dimensions: As indicated.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. VCT and Asphalt Tile Adhesives: 50 g/L.
b. Cove Base Adhesives: 50 g/L.
c. Rubber Floor Adhesives: 60 g/L.

C. 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 installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
3. Moisture 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 tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.

E. Use trowelable leveling and patching compound to fill cracks, holes, slab depressions (at LCE Offices) and other depressions in substrates.

F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles in pattern indicated as determined by architect when colors are selected.

B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, doorframes, thresholds, and nosings.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.

F. Premolded Corners: Install premolded corners before installing straight pieces.

3.5 RESILIENT ACCESSORY INSTALLATION

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.6 CLEANING AND PROTECTION

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

    a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.

    a. Coordinate selection of floor polish with the DCAM Project Manager's maintenance service.

2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved.

Slide or roll objects over panels without moving panels.

END OF SECTION

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SECTION 09 68 13

TILE CARPETING

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Division.

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

1.2 SECTION INCLUDES

A. Carpet tile flooring as indicated on the drawings and schedules.

B. Alternates: Add Alternate #1 Alterations and Reconfiguration of the Main Office.

1.3 RELATED DOCUMENTS

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

1.4 SUMMARY

A. Section includes modular, tufted carpet tile (Lees)

B. Related Requirements:
1. Division 02 Section "Selective Structure Demolition" for removing existing floor coverings.

1.5 PREINSTALLATION MEETINGS

A. Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference.

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.
d. Review room finish schedule.
e. Review tile directional instructions on drawings.
f. Review cut in requirements at shelving and tables.

1.6 SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:
   1. Retain, delete, or revise subparagraphs below to suit Project.
   2. Columns, doorways, enclose walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   3. Carpet tile type, color, and dye lot.
   4. Type of subfloor.
   5. Type of installation.
   6. Pattern of installation.
   7. Pattern type, location, and direction.
   8. Pile direction.
   9. Type, color, and location of insets and borders.
   10. Type, color, and location of edge, transition, and other accessory strips.
   11. Transition details to other flooring materials.

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 Tile: Full-size Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, 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 tile.

1.9 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 Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. .

1.10 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. Revise "Fire-Test-Response Ratings" Paragraph below if authorities having jurisdiction require other fire tests.

C. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. Build mockups at locations and in sizes shown on Drawings.
   2. Retain subparagraph below if the intention is to make an exception to the default requirement in Division 01 Section "Quality Requirements" for demolishing and removing mockups.
   3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.12 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, 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.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.13 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
   1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
   2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, excessive fading and delamination.
   3. Verify available warranties and warranty periods for carpet tiles.
   4. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE as indicated on Drawings.

A. Products: Subject to compliance with requirements, provide the following:

   1. Lees Carpet "Denim" collection
   2. Color: to be selected by architect
   3. Pattern: Textured patterned loop
   4. Fiber Content: 100 percent nylon 6, 6.
   5. Fiber Type: Duracolor Premium Nylon with Antron Legacy.
   6. Pile Characteristic: Level-loop pile.
   7. Density: 5,942 oz./cu. yd. .
   8. Pile Thickness: .103 inches for finished carpet tile according to ASTM D 6859.
   9. Stitches: 11.0 stitches per inch .
   10. Gage: 1/12 ends per inch .
   11. Surface Pile Weight: 17 oz./sq. yd .
   12. Backing System: Ecoflex ICT.
   13. Size: 24 by 24 inches .
   14. Antimicrobial Treatment: "Bioguard".
   15. Performance Characteristics: As follows:
      a. Appearance Retention Rating: [Moderate traffic, 2.5] [Heavy traffic, 3.0] [Severe traffic, 3.5] <Insert number> minimum according to ASTM D 7330.
      b. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
      c. Dry Breaking Strength: Not less than 100 lbf according to ASTM D 2646.
      d. Tuft Bind: Not less than 10 lbf according to ASTM D 1335.
      e. Delamination: Not less than 4 lbf/in. according to ASTM D 3936.
      f. Dimensional Tolerance: Within 1/32 inch of specified size dimensions, as determined by physical measurement.
      g. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
      h. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
      i. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) according to AATCC 16, Option E.
      j. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

k. Electrostatic Propensity: Less than 3.0 kV according to AATCC 134.
l. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.

16.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

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."

C. 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 tile performance. Examine carpet tile 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 tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. 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 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

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 tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method Glue down; install every tile with full-spread, releasable, pressure-sensitive adhesive.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile 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.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile 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 tile manufacturer.

END OF SECTION 096813

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SECTION 09 90 00
PAINTING
(FILED SUB-BID REQUIRED)

PART 1 GENERAL

1.00 FILED SUB-BID REQUIREMENT

A. The Painting filed sub-bid includes the Work specified in the following Sections:
   1. 09 90 00, Unit Masonry Assemblies

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The work of this Section is shown on Drawings: Cover Sheet, A-1.0, A-1.2, A-1.5, A-3.0, A-4.0, A-4.1, A-4.2, A-4.3, A-4.4, A-5.5, A-5.6 & A-6.0.

1.1 GENERAL PROVISIONS

A. Division 1, General Conditions, Supplementary General Conditions, the Drawings, and all other parts of the Contract Documents are hereby made a part of this Division.

1.2 SUMMARY

A. Surface preparation and field application of paints and coatings of interior surfaces as called for in the Drawings. Work includes:

   1. New and repaired plaster/drywall ceiling and wall surfaces as indicated on drawings, including miscellaneous metal and other appurtenances as indicated.
   2. Existing hollow metal doors and frames.
   3. Existing flush wood door refinishing.
   4. New wood paneling, caps, and trim.
   5. All exposed galvanized conduit.

B. **Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.**

1.3 RELATED SECTIONS

Division	1	–General Requirements, all Sections
Section	06 10 00	–Finish Carpentry
Section	07 90 00	–Joint Sealers
Section	23 00 00	–Electrical

1.4 REFERENCES

A. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.

B. ASTM D2016 - Test Method for Moisture Content of Wood.

C. NPCA (National Paint and Coatings Association) - Guide to U.S. Government Paint Specifications.

D. PDCA (Painting and Decorating Contractors of America) - Painting - Architectural Specifications Manual.

1.5 DEFINITIONS

A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 30 00.

B. Product Data: Provide data on all finishing products.

C. Samples: Submit two samples, 4x4 inch in size illustrating colors for each color selected.

D. Manufacturer's Instructions: Indicate special surface preparation procedures, substrate conditions requiring special attention, and maintenance recommendations.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Applicator: Company specializing in performing the work of this section with minimum three years documented experience on rehabilitation projects.

C. Exterior and Interior painting: Company specializing in performing the work of this section with minimum three years documented experience on rehabilitation projects.

1.8 STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 01600.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

C. Container label to include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

D. Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F (7 degrees C) for interiors; 50 degrees F (10 degrees C) for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F (18 degrees C) for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Minimum Application Temperature for Oil based primer: 40 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

1.10 EXTRA MATERIALS

A. Furnish under provisions of Section 01700.

B. Provide 1 gallon of each color to Owner.
Label each container with color, type, texture, and location in addition to the manufacturer's label.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers – Paint and Stain
1. Benjamin Moore Company
2. Duron Paints and Wallcovering Inc.
3. PPG Pittsburgh Paints

4. Tnemec
5. International

B. Manufacturers - Primer Sealers: as required by paint manufacturer.

C. Substitutions: Under provisions of Section 01600. Any substitutions must be approved for color and manufacturer.

2.2 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating; good flow and brushing properties; capable of drying or curing free of streaks or sags.

B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

2.3 FINISHES

A. Refer to schedule at end of section for surface finish schedule.

B. Refer to finish schedule in drawings for number of colors and locations. Colors to be selected by the Owner from manufacturer's standard.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 30 00.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Test shop applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
1. Interior Wood: 15 percent, measured in accordance with ASTM D2016.

3.2 PREPARATION

A. The Contractor shall ascertain the suitability of all surfaces to receive paint. He shall replace rotted wood, fill cracks as specified, putty holes and otherwise ensure a good paintable surface. He shall notify the Architect in writing of any defects detrimental to his work should they be beyond the realm of his

responsibilities. The application of paint shall be construed as acceptance of surfaces by the Contractor, who will then be held responsible for the finished work.

B. Correct defects and clean surfaces which affect work of this section. Remove existing coatings that exhibit loose surface defects. Prepare all surfaces by scraping and removing loose and deteriorated paint. Sand margins of scraped areas to feather to paint surface that remains.

1. Surfaces previously painted with calcimine shall be peeled back, washed with bleach and TSP or an acceptable substitute, painted with an acrylic bonding agent. Edges shall be feathered with joint compound and painted with an oil primer.

C. Seal wood surfaces with shellac and seal marks which may bleed through surface finishes.

D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.

F. Copper Surfaces Scheduled for a Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.

G. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.

H. Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter by mechanical means such as wire brush. Sand margins of scraped areas to feather to paint surface that remains. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

I. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

J. Shop Primed Steel and Iron Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare surfaces.

K. Shop Primed Steel and Iron Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare surfaces.

L. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

M. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Prepare all surfaces by scraping and removing loose and deteriorated paint. Sand margins of scraped areas to feather to paint surface that remains. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

N. Wood Doors Scheduled for touch up painting: Seal top and bottom edges with primer.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish. Brush apply paint evenly without runs, sags or other defects, each coat shall be thoroughly worked into the material being coated at the average rate of coverage recommended by the material manufacturere for the type of surface involved. Cover all surfaces completely to provide uniform color and appearance. All parts of mouldings, trim, ornaments, edges and millwork shall be left clean and true to details without undue amount of paint in corners or depressions. Make edges of colors sharp and clean, without overlapping.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand wood and metal lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow applied coat to dry before next coat is applied.

H. Prime concealed surfaces of exterior woodwork with primer paint.

I. The Contractor shall protect all surfaces from paint drips and spillage, as well as undue wear. Original surfaces are not to be damged. Any paint on extraneous surfaces shall be thoroughly cleaned off at completion of the project.

J. The Contrator shall remove all hardware, accessories, device plates, lighting fixtures, etc. or provide ample in place protection. Upon completion of each part of the work, all these are to be carefully replaced or uncovered. Use only skilled labor for removal, replacement and protection.

K. Use dropcloths free of holes and of adequate size to protect all other surfaces.

3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400.

3.5 CLEANING

A. Clean work under provisions of Section 01700.

B. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.6 PAINT SCHEDULE

A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.

B. Paint Schedule for Standard Performance Coatings:

1. Metal (New)
   a. One Coat:

      1) Tnemec N69 Epoxoline at 3.0 mils DFT
      2) PPG PMC Amerlock 400 Hi-Build Epoxy at 4.0-5.0 mils DFT
      3) Dupont 25P High Solids at 4.0 mils DFT
      4) International Intergard 475 HS at 5.0 to 10.0 mils DFT

   b. And One Coat
      1) Tnemec V73 Endura-Shield at 3.0 mils DFT
      2) PPG PMC Amercoat 450H Polyurethane at 3.0 mils DFT
      3) Dupont Imron 2.8 Urethane at 3.0 to 4.0 mils DFT
      4) International Interthane 990 HS at 3.0 to 4.0 mils DFT

2. Metal (Previousl Painted)
   a. Spot Prime (If necessary): Any areas of bare metal with Tnemec Series 135 Chembuild applied at 4.0-5.0 mils DFT
   b. One Coat:
      1) Tnemec Series 1029 Enduratone applied at 2.0-3.0 mils DFT.
   c. One Coat:
      1) Tnemec Series 1081 Endura-Shield applied at 2.0-3.0 mils DFT.

3. Galvanized Metal (not shop-finished under Section 05120 - STRUCTURAL STEEL FRAMING or Section 05500 - METAL FABRICATIONS): (Surface Preparation: SSPC-SP7 Brush-off Blast)

   a. One Coat

1) Tnemec N69 Epoxoline at 3.0 mils DFT
2) PPG PMC Amerlock 400 Hi-Build Epoxy at 4.0-5.0 mils DFT
3) Dupont 25P High Solids at 4.0 mils DFT
4) International Intergard 475 HS at 5.0 to 10.0 mils DFT

b. And One Coat
1) Tnemec V73 Endura-Shield at 3.0 mils DFT
2) PPG PMC Amercoat 450H Polyurethane at 3.0 mils DFT
3) Dupont Imron 2.8 Urethane at 3.0 to 4.0 mils DFT
4) International Interthane 990 HS at 3.0 to 4.0 mils DFT

4. Interior Gypsum Wallboard and Plaster for Latex Eggshell Finish:

a. One Coat
1) Moore Ecospec Interior Latex Primer Sealer (231)
2) Duron Genesis Latex Primer
3) PPG Pure Performance Latex Primer
b. And Two Coats
1) Moore Pristine Ecospec Interior Latex Eggshell (223)
2) Duron Genesis Latex Eggshell
3) PPG Pure Performance Latex Eggshell

5. .Interior Gypsum Wallboard and Plaster Ceilings for Latex Flat Finish:

a. One Coat
1. Moore Ecospec Interior Latex Primer Sealer (231)
2. Duron Genesis Latex Primer
3. PPG Pure Performance Latex Primer
b. And Two Coats
1. Moore Pristine Ecospec Interior Latex Flat (219)
2. Duron Genesis Latex Flat
3. PPG Pure Performance Latex Eggshell

6. Interior Gypsum Wallboard and Plaster for Latex Semi-Gloss Finish:

a. One Coat
1. Moore Ecospec Interior Latex Primer Sealer (231)
2. Duron Genesis Latex Primer
3. PPG Pure Performance Latex Primer
b. And Two Coats
1. Moore Pristine Ecospec Interior Latex Semi-Gloss (224)
2. Duron Genesis Latex Semi-Gloss
3. PPG Pure Performance Latex Semi-Gloss

7. Interior Architectural Woodwork, Finish Carpentry, and Wood Doors for Latex Semi-Gloss Paint Finish (softwoods, paint grade hardwoods, MDO, and hardwood veneers):

a. One Coat
1. Moore Ecospec Interior Latex Primer Sealer (231)
2. Duron Genesis Latex Primer
3. PPG Pure Performance Latex Primer

b. And Two Coats
1. Moore Pristine Ecospec Interior Latex Semi-Gloss (224)
2. Duron Genesis Latex Semi-Gloss
3. PPG Pure Performance Latex Semi-Gloss

8. Wood - Transparent:
a. Filler coat (for open grained wood only).
b. Two coats of stain.
c. One coat sealer.
d. Two coats of varnish satin.

9. Concrete, Concrete Block, Restored Masonry, Cement Plaster for Latex Semi-Gloss Finish:

a. One Coat
1) Moore Latex Block Filler M88
2) Duron Block Kote Acrylic Latex Block Filler
3) PPG LTC Block Surfacer
b. And Two Coats
1) Moore Pristine Ecospec Interior Latex Semi-Gloss (224)
2) Duron Genesis Latex Semi-Gloss
3) PPG Pure Performance Latex Semi-Gloss

10. Concrete Block, Brick Masonry (previously Painted):
a. One Coat
1) Tnemec Series 151 Elasto-Grip applied at 1.0-1.5 mils
b. And One Coat
1) Tnemec Series 1029 Enduratone applied at 2.0-3.0 mils DFT.
c. And One Coat
1) 3rd Coat: Tnemec Series 1081 Endura-Shield applied at 2.0-3.0 mils DFT.

C. Colors
1. As indicated in finish schedule on drawings
2. Wood shall be clear coat, natural finish.

END OF SECTION

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SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Code-required interior panel signage, including but not limited to, accessibility signage, toilet room signage, classroom signage and mechanical and electrical room signage.

B. Alternates: Add Alternate #1 .Alterations and Reconfiguration to the Main Office

C. Items To Be Installed Only: Not Applicable.

D. Items To Be Furnished Only: Not Applicable.

E. Related Work: The following items are not included in this Section and will be performed under the designated Sections:.
1. Section 26 00 00 - ELECTRICAL WORK for illuminated exit signs.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and Braille layout.

C. Samples for Verification: For each type of sign, include the following Samples to verify color selected:

1. Panel Signs: Full-size Samples of each type of sign required.
2. Approved samples will not be returned for installation into Project.

D. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each sign type through one source from a single manufacturer.

B. Regulatory Requirements: Comply with the Massachusetts Architectural Access Board, Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.

B. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Panel Material: Opaque acrylic sheet.
2. Raised-Copy Thickness: Not less than 1/32 inch

C. Symbols of Accessibility: Provide 6-inch- high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

2.2 ACCESSORIES

A. Mounting Methods: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.

B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Verify that items provided under other sections of Work are sized and located to accommodate signs.

C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by the DCAM Project Manager.

END OF SECTION

SECTION 10 21 23

CUBICLE CURTAINS AND TRACK

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. Curtain tracks and carriers.
2. Cubicle curtains.

B. Alternates: Add Alternate #1 Alterations and Reconfiguration of the Main Office

C. Related Requirements:

1. Section 09 51 20 "Acoustical Tile Ceilings" for supplementary wood framing and blocking for mounting items requiring anchorage.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include durability, laundry temperature limits, fade resistance, applied curtain treatment, and fire-test-response characteristics for each type of curtain fabric indicated.
2. Include data for each type of track.

B. Shop Drawings:

1. Show layout and types of cubicles, sizes of curtains, number of carriers, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
2. Include details on independent attachment above ceiling.

C. Samples: For each exposed product and for each color and texture specified, 10 inches in size.

D. Samples for Initial Selection: For each type of curtain material indicated.

E. Samples for Verification: For each type of product required, prepared on Samples of size indicated below:

1. Curtain Fabric: 10-inch- square swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.
2. Mesh Top: Not less than 10 inches square.
3. Curtain Track: Not less than 10 inches long.
4. Curtain Carrier: Full-size unit.
5. IV Hanger: Full-size unit.
6. IV Track: Not less than 10 inches long.
7. IV Carrier: Full-size unit.

F. Curtain and Track Schedule: Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For curtains, track, and hardware to include in operation and maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Curtain Carriers and Track End Caps: Full-size units equal to 3 percent of amount installed for each size indicated, but no fewer than 2 units.
2. Curtains: Full-size units equal to 10 percent of amount installed for each size indicated, but no fewer than two units.

1.6 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical cubicle, complete with track, curtain, 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Curtains: Provide curtain fabrics with the following characteristics:

1. Launderable to a temperature of not less than 160 deg F 90 deg F.
2. Flame resistant and identical to those that have passed NFPA 701 when tested by a testing and inspecting agency acceptable to authorities having jurisdiction.

a. Identify fabrics with appropriate markings of a qualified testing agency.

2.2 CURTAIN SUPPORT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Automatic Devices Company.
2. Covoc Corporation.
3. Cubicle Curtain Factory, Inc.
4. InPro Corporation (IPC).

B. Extruded-Aluminum Curtain Track: Not less than 1-1/4 inches wide by 3/4 inch high; with 0.062-inch minimum manufacturer's standard wall thickness.

1. Curved Track: Factory-fabricated, 12-inch- radius bends.
2. Finish: Baked enamel, acrylic, or epoxy.

C. PVC Curtain Track: Not less than 1-1/4 inches wide by 15/16 inch high.

1. Curved Track: Factory-fabricated, 12-inch- radius bends.

D. Curtain Track Accessories: Fabricate splices, end caps, connectors, end stops, coupling and joining sleeves, wall flanges, brackets, ceiling clips, and other accessories from same material and with same finish as track.

1. Suspended-Track Support: Suspended ceiling attachment with independent wire support independent of the Acoustical Ceiling Track.
2. End Stop: Removable with carrier hook.
3. Switch Unit: Shuttle and coupling device for rerouting and securing cubicle curtain, with pull chain for switching track.

(16-mm-)Curtain Carriers: Two nylon rollers and nylon axle with chrome-plated steel hook.

F. Breakaway Curtain Carriers: Velcro breakaway curtain carriers designed to allow curtains to detach from tracks with a pulling force of no more than 5 lbf.

G. Exposed Fasteners: Stainless steel.

H. Concealed Fasteners: Stainless steel.

2.3 CURTAINS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Covoc Corporation.
2. Cubicle Curtain Factory, Inc.
3. InPro Corporation (IPC).
4. Automatic Devices Company.

B. Curtain Grommets: Two-piece, rolled-edge, rustproof, nickel-plated brass; spaced not more than 6 inches o.c.; machined into top hem.

C. Mesh Top: Not less than 20-inch- high mesh top of No. 50 nylon mesh.

D. Beaded-Chain Curtain Drop: 6 inches long; nickel-plated steel with aluminum hook.

E. Curtain Tieback: Nickel-plated brass chain; one at each curtain termination.

2.4 CURTAIN FABRICATION

A. Fabricate curtains as follows:

1. Width: Equal to track length from which curtain is hung plus 10 percent added fullness, but not less than 12 inches added fullness.
2. Length: Equal to floor-to-ceiling height, minus depth of track and carrier at top, and minus clearance above the finished floor as follows:

   a. Cubicle Curtains: 12 inches.

3. Top Hem: Not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched.
4. Mesh Top: Top hem of mesh not less than 1 inch and not more than 1-1/2 inches wide, triple thickness, reinforced with integral web, and double lockstitched. Double lockstitch bottom of mesh directly to 1/2-inch triple thickness, top hem of curtain fabric.
5. Bottom Hem: Not less than 1 inch and not more than 1-1/2 inches wide, double thickness and single lockstitched.
6. Side Hems: Not less than 1/2 inch and not more than 1-1/4 inches wide, with double turned edges, and single lockstitched.

B. Vertical Seams: Not less than 1/2 inch wide, double turned and double stitched.

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 INSTALLATION

A. General: Install tracks level and plumb, according to manufacturer's written instructions.

B. Up to 20 feet in length, provide track fabricated from single, continuous length.

1. Curtain Track Mounting: Surface.

C. Surface-Track Mounting: Fasten tracks to ceilings at intervals recommended by manufacturer. Fasten tracks to structure at each splice and tangent point of each corner. Center fasteners in track to ensure unencumbered carrier operation. Attach track to ceiling as follows:
1. Attach track to suspended ceiling grid with manufacturer's proprietary clip (independently wire hung from underside of deck).

D. Suspended-Track Mounting: Install track with manufacturer's standard tubular aluminum suspended supports at intervals and with fasteners recommended by manufacturer. Fasten supports to structure. Provide supports at each splice and tangent point of each corner. Secure ends of track to wall with flanged fittings or brackets.

E. Track Accessories: Install splices, end caps, connectors, end stops, coupling and joining sleeves, and other accessories as required for a secure and operational installation.

1. Provide one locking switch unit for each pair of beds.
2. Provide one hinged loading unit for each bed.

F. Curtain Carriers: Provide curtain carriers adequate for 6-inch spacing along full length of curtain plus an additional carrier.

G. Curtains: Hang curtains on each curtain track. Secure with curtain tieback.

END OF SECTION 102123

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SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers, cabinets and accessories as required by Commonwealth of Massachusetts Building Code and the City of Newton Fire Department.

B. Alternates: Add Alternate #1 Alteration and Reconfiguration of the Main Office.

C. Items included:
1. Fire extinguishers.
2. Fire blankets.
3. Cabinets.
4. Accessories.

1.2 RELATED SECTIONS

Division	1	--	General Requirements, all Sections
Section	06 10 00	--	Rough Carpentry
Section	06 20 00	--	Finished Carpentry
Section	09 90 00	--	Painting

1.3 REFERENCES

A. NFPA 10 - Portable Fire Extinguishers.

B. UL 8 - Foam Fire Extinguishers.

C. UL 92 - Fire Extinguisher and Booster Hose.

D. UL 154 - Carbon Dioxide Fire Extinguishers.

E. UL 299 - Dry Chemical Fire Extinguishers.

F. UL 626 - 2 1/2 Gallon Stored Pressure, Water Type Fire Extinguishers.

G. UL 711 - Rating and Fire Testing of Fire Extinguishers.

H. UL 1093 - Halogenated Agent Fire Extinguishers.

1.4 SUBMITTALS FOR REVIEW

A. Section 01 30 00 - Submittals: Procedures for submittals.

B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, and location.

C. Product Data: Provide extinguisher operational features, color and finish, anchorage details and maintenance requirements.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 70 00 - Operation and Maintenance Data: Procedures for submittals.

B. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.6 QUALITY ASSURANCE

A. Provide units conforming with UL 711 or UL 92 as applicable. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

1. General Fire Extinguisher Corp.
2. Grinnell Corp.
3. Kidde Fire Extinguishers
4. Larsen's Manufacturing Co.
5. Nystrom Products Co.
6. Potter-Roemer Co.
7. Substitutions: Permitted per Section 01 60 00 - Materials and Equipment

2.2 EXTINGUISHERS

A. Extinguishers shall be type ABC, 10 pound unless otherwise required by authority having jurisdiction.

B. Extinguisher Identification: Provide signs and identification to comply with 527 CMR 10.02.

C. Extinguisher Finish: Cast Steel, red enamel color

2.3 CABINETS

A. Metal: Formed sheet steel, primed, 18 gage thick base metal.

B. Configuration: Semi-recessed type, sized to accommodate accessories.

C. Trim Type: Returned to wall surface, ¾ inch wide face.

D. Door: 18 gauge thick, reinforced for flatness and rigidity; lock with break glass access.

E. Door Glazing: Glass, clear, 1/8 inch thick float.

F. Cabinet Mounting Hardware: Appropriate to cabinet.

G. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

H. Pre-drill for anchors.

I. Hinge doors for 180 degree opening with continuous piano hinge.

J. Weld, fill, and grind components smooth.

K. Glaze doors with resilient channel gasket glazing.

L. Finishing Cabinet Exterior Trim and Door: Primed for field paint finish.

M. Finishing Cabinet Interior: alkyd enamel.

PART 3 EXECUTION

3.1 EXAMINATION

A. A. Section 01 30 00 – Administrative Requirements: Verification of existing conditions before starting work.

B. B. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, 36 inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

3.3 SCHEDULES

A. See Drawings for location.

END OF SECTION

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TOILET AND BATH ACCESSORIES

SECTION 10 80 00

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Toilet and washroom accessories as indicated on Drawings.

B. Grab bars as indicated on Drawings and as required by the Commonwealth of Massachusetts Architectural Access Board.

C. Attachment hardware.

D. Alternates: Add Alternate #1 Alterations and Reconfiguration of the Main Office

1.2 RELATED WORK

Division	1	–	General Requirements, all Sections
Section	06 10 53	–	Miscellaneous Rough Carpentry
Section	09 90 00	–	Painting
Section	22 00 00	-	Plumbing
Section	23 00 00	–	Mechanical
Section	26 00 01	–	Electrical

1.3 REFERENCES

A. ANSI A117.1 - Safety Standards for the Handicapped.

B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

C. ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

D. ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

E. ASTM A366 - Steel, Carbon, Cold-Rolled Sheet, Commercial Quality.

F. ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

G. NEMA LD-3 - High Pressure Decorative Laminates.

1.4 SUBMITTALS

A. Submit under provisions of Division 1.

B. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.

C. Samples: Submit two samples of each component, illustrating color and finish.

D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and blocking requirements.

1.5 REGULATORY REQUIREMENTS

A. Conform to ANSI A117.1 code for access for the handicapped and Commonwealth of Massachusetts Architectural Access Board requirements.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as instructed by the manufacturer.

1.7 COORDINATION

A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. All equipment based on Bobrick Washroom Equipment, Inc "Classic" series for the purpose of establishing type and quality.

B. Bobrick Washroom Equipment Inc. "Classic" Series.
1. Tissue Dispenser: Bobrick B-2888 Stainless Steel Surface mounted multi-roll type.

2. Paper Towel Dispenser: Bobrick #B-3909 Stainless Steel Paper Towel Dispenser and Waste Receptacle, Surface Mounted

3. Soap Dispenser: Bobrick #B-2111 Stainless Steel surface mounted

4. Mirror: Bobrick# B-165 Mirror with Stainless Steel Channel Frame and Float Glass Mirror, size as per drawings.

5. Grab Bars: Bobrick #B-5806.99-Extra-Heavy-Duty with Concealed Mounting, Polished Ends, Peened Grip. 18 gauge type 304

6. Sanitary Napkin Dispenser: Bobrick # B-352-25 Recessed Napkin/Tampon Vendors, type 304, 22 gauge.

7. Sanitary Napkin Disposal: Bobrick #B-353, recessed.

C. Substitutions: Section 01 60 00 Product Substitutions and substitution form.

2.2 MATERIALS

A. Sheet Steel: ASTM A366.

B. Stainless Steel Sheet: ASTM A167, Type 304.

C. Tubing: ASTM A269, stainless steel.

D. Plastic Laminate: NEMA LD-3, General Purpose Type; 0.125 inch (3.2 mm) thick.

E. Adhesive: Two component epoxy type, waterproof.

F. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, and security type.

G. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 FABRICATION

A. Weld and grind joints of fabricated components, smooth.

B. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion. Maintain surfaces without scratches or dents.

C. Fabricate grab bars of tubing, free of visible joints, return to wall with end attachment flanges. Knurl grip surfaces.

D. Shop assemble components and package complete with anchors and fittings.

E. Provide steel anchor plates, adapters, and anchor components for installation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings and as instructed by the manufacturer.

B. Verify exact location of accessories for installation.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions and ANSI A117.1.

B. Install plumb and level, securely and rigidly anchored to substrate.

3.4 SCHEDULE

A. Accessible Toilet Rooms

1. Tissue Dispenser, at each toilet

2. Paper Towel Dispenser, Surface Mounted

   a. One at single bathrooms
   b. Two at multiple fixture bathrooms

3. Soap Dispenser, surface wall mounted, one per lavatory

4. Mirror, centered on each sink, see elevations for sizes

5. Grab Bars, two at each accessible toilet, see elevations

6. Sanitary Napkin Dispenser, one per toilet in adult female rooms

7. Sanitary Napkin Disposal, one per toilet in adult female rooms

END OF SECTION

SECTION 12 32 13

MANUFACTURED WOOD-VENEER-FACED CASEWORK

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 manufactured wood-veneer-faced cabinets of stock design.

B. Alternates: Add Alternate #1 Alterations and Reconfiguration of the Main Office

C. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood blocking for anchoring casework.
2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring casework.
3. Section 096519 "Resilient Flooring" for resilient base applied to wood-veneer-faced casework.
4. Section 12 36 23.13 "Plastic-Laminate-Clad Countertops."

1.3 DEFINITIONS

A. Definitions in the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" apply to the work of this Section.

B. MDF: Medium-density fiberboard.

C. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that casework can be supported and installed as indicated.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show fabrication details, including types and locations of hardware. Show installation details, including field joints and filler panels. Indicate manufacturer's catalog numbers for casework.

C. Samples: For cabinet finishes.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer manufacturer.

B. Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

C. Sample Warranty: For special warranty.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each type and finish of casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

1.9 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation of units required for this Project and who is a certified participant in the AWI's Quality Certification Program.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other-than-installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period. Maintain temperature and relative humidity during the remainder of the construction period in range recommended for Project location by the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

C. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.12 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of casework that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Delamination of components or other failures of glue bond.
b. Warping of components.
c. Failure of operating hardware.
d. Deterioration of finishes.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. CampbellRhea.
2. R. C. Smith Company.
3. Terrill Manufacturing Company.
4. TMI Systems Design Corporation.

5. Windham Millwork, Inc.

B. Source Limitations: Obtain wood-veneer-faced casework from single manufacturer.

2.2 CASEWORK, GENERAL

A. Quality Standard: Unless otherwise indicated, comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" for grades of casework indicated for construction, finishes, installation, and other requirements.

1. Grade: Custom.
2. Provide labels from AWI certification program indicating that casework, including installation, complies with requirements of grades specified.

B. Product Designations: Drawings indicate configurations of manufactured wood-veneer-faced casework by referencing designations of Casework Design Series numbering system in Appendix A of the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

2.3 WOOD-VENEER-FACED CABINETS

A. Design:
1. Reveal overlay.

B. Wood Species: Red oak.

C. Face Veneer Cut: Rift cut.

D. Veneer Matching:

1. None required; select and arrange veneers for compatible grain and color.
2. Provide veneers for each cabinet from a single flitch, slip and balance matched.

   a. Provide continuous matching of adjacent drawer fronts within each cabinet.

3. Provide veneers for each elevation from a single flitch, slip and balance matched.

   a. Provide continuous matching of adjacent drawer fronts within each cabinet and end matching between drawer fronts of adjacent cabinets.

E. Grain Direction:
1. Vertical on doors, horizontal on drawer fronts.
2. Lengthwise on face frame members.
3. Vertical on end panels.
4. Side to side on bottoms and tops of units.
5. Vertical on knee-space panels.
6. Horizontal on aprons.

F. Exposed Materials:

1. Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Provide backs of same species as faces.
2. Solid Wood: Clear hardwood lumber of species indicated and selected for grain and color compatible with exposed plywood.

G. Semiexposed Materials:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of same species as exposed wood.
2. Plywood: Hardwood plywood of same species as exposed wood. Provide backs of same species as faces.
3. Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.
4. Hardboard: Use only for cabinet backs where exterior side of back is not exposed.

H. Concealed Materials:

1. Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.
2. Plywood: Hardwood plywood. Provide backs of same species as faces.
3. Hardboard.

2.4 MATERIALS

A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.

B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated.

C. Softwood Plywood: DOC PS 1.

D. Hardboard: ANSI A135.4, Class 1 Tempered.

E. Edgebanding: Minimum 1/8-inch- thick, solid wood of same species as face veneer Wood veneer of same species as face veneer.

1. Select wood edgebanding for grain and color compatible with face veneers.

2.5 COLORS AND FINISHES

A. Wood Colors and Finishes: As selected by Architect from casework manufacturer's full range.

2.6 FABRICATION

A. Wood-Veneer-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1. Bottoms of Cabinets and Tops of Wall Cabinets: 3/4-inch veneer-core hardwood plywood.
2. Ends of Cabinets: 3/4-inch hardwood plywood.
3. Shelves: 3/4-inch veneer-core hardwood plywood or 1-inch particleboard-core hardwood plywood.
4. Base Cabinet Top Frames: 3/4-by-2-inch solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
5. Backs of Cabinets: 3/4-inch particleboard-core hardwood plywood where exposed, 1/4-inch hardboard, dadoed into sides, bottoms, and tops where not exposed.
6. Drawer Fronts: 3/4-inch particleboard-core hardwood plywood or solid hardwood.
7. Drawer Sides and Backs: 1/2-inch solid-wood or hardwood plywood, with glued dovetail or multiple-dowel joints.
8. Drawer Bottoms: 1/4-inch veneer-core hardwood plywood, glued and dadoed into front, back, and sides of drawers. Use 1/2-inch material for drawers more than 24 inches wide.
9. Doors 48 Inches or Less in Height: 3/4 inch thick, with solid hardwood stiles and rails, particleboard or MDF cores, and hardwood face veneers and crossbands.
10. Doors More Than 48 Inches in Height: 1-1/16 inches thick, with solid hardwood stiles and rails, honeycomb cores, and hardwood face veneers and crossbands.

B. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

2.7 FINISH

A. Preparation: Sand lumber and plywood for manufactured wood casework construction before assembling. Sand edges of doors and drawer fronts and molded shapes with profile-edge sander. Sand casework after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust and apply wash-coat sealer and stain to exposed and semiexposed surfaces as required to provide uniform color and to match approved samples.

C. Finishing Open-Grain Woods: Apply manufacturer's standard three-coat, baked, clear finish consisting of a thermosetting catalyzed sealer and two coats of a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat and between topcoats. Topcoats may be omitted on concealed surfaces.

2.8 CASEWORK HARDWARE AND ACCESSORIES

A. Hardware, General: Unless otherwise indicated, provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware.

   1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard, except where hardware is through bolted from back side.

B. Butt Hinges: Stainless-steel, semiconcealed, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two hinges for doors less than 48 inches high, and provide three hinges for doors more than 48 inches high.

C. Pulls: Solid stainless-steel wire pulls, fastened from back with two screws. For sliding doors, provide recessed stainless-steel flush pulls. Provide two pulls for drawers more than 24 inches wide.

D. Door Catches: Powder-coated, dual, self-aligning, permanent magnet catch. Provide two catches on doors more than 48 inches high.

E. Drawer Slides: BHMA A156.9, Type B05091.
   1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-overtravel-extension type; zinc-plated, steel ball-bearing slides.

F. Drawer and Hinged Door Locks: Mortise type, five-pin tumbler, brass with chrome-plated finish, and complying with BHMA A156.11, Grade 1.

   1. Provide a minimum of two keys per lock and six master keys.
   2. Provide locks on all doors and drawers at Nurse's Office.

G. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door unit.

H. Adjustable Shelf Supports: Mortise-type, powder-coated steel standards and shelf rests complying with BHMA A156.9, Type B04071 and Type B04091.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

A. Grade: Install cabinets to comply with same grade as item to be installed.

B. Install casework level, plumb, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

C. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Align similar adjoining doors and drawers to a tolerance of 1/16 inch. Bolt adjacent cabinets together with joints flush, tight, and uniform.

D. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten cabinets to hanging strips, masonry, framing, wood blocking, or reinforcements in walls and partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

E. Fasten cabinets to adjacent cabinets and to masonry, framing, wood blocking, or reinforcements in walls and partitions to comply with the AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."

F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 CLEANING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 12 32 13

SECTION 12 36 23.13
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 SUMMARY

A. Section includes plastic-laminate countertops.

B. Alternates: Add Alternate #1 Alterations and Reconfiguration of the Main Office.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including high-pressure decorative laminate adhesive for bonding plastic laminate and fire-retardant-treated materials.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1. Show locations and sizes of cutouts and holes for plumbing fixtures faucets electrical switches and outlets and other items installed in plastic-laminate countertops.
2. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:

1. Plastic laminates.

D. Samples for Verification:

1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish, with one sample applied to core material and specified edge material applied to one edge.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer fabricator.

B. Product Certificates: For the following:

1. Composite wood and agrifiber products.
2. High-pressure decorative laminate.
3. Chemical-resistant, high-pressure decorative laminate.
4. Adhesives.

C. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance. Shop is a certified participant in AWI's Quality Certification Program.

B. Installer Qualifications: Fabricator of products Certified participant in AWI's Quality Certification Program.

C. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver countertops until painting and similar operations that could damage countertops have been completed in installation areas. If countertops must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install countertops until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

C. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Established Dimensions: Where countertops are indicated to fit to other construction, establish dimensions for areas where countertops 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 PLASTIC-LAMINATE COUNTERTOPS

A. Counter Top & Backsplash Laminate:
   1. Acceptable Manufacturers
      a. Wilsonart Laminate by Wilsonart LLC.
      b. Lamin-Art
      c. Formica Laminate by the Formica Group

   2. Design Standard
      a. Wilsonart High Wear Laminate
      b. Surface Locations: Countertop, backsplash, edge trim.
      c. Product Type: 107HW General Purpose
      d. Quality Assurance: Material shall equal or exceed performance standards set by the American National Standards Institute/National Electrical Manufacturers Association (ANSI/NEMA) LD3-2005 for high-pressure laminate. Fabrication shall comply with "Architectural Woodwork Quality Standards, Guide Specifications and Quality Certification Program" guidelines of the Architectural Woodwork Institute.

   3. Adhesive: Manufacturer Recommended

B. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.

   1. Provide labels and certificates from AWI certification program indicating that countertops, including installation, comply with requirements of grades specified.
   2. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard.

Comply with those selections and requirements in addition to the quality standard.

C. Grade: Custom.

D. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGF.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As indicated by manufacturer's designations.
2. As selected by Architect from manufacturer's full range in the following categories:

   a. Solid colors, matte finish.
   b. Solid colors with core same color as surface, matte finish.
   c. Wood grains, matte finish.
   d. Patterns, matte finish.

3. Grain Direction: Parallel to cabinet fronts.

F. Edge Treatment: Same as laminate cladding on horizontal surfaces As indicated.

G. Core Material: Medium-density fiberboard made with exterior glue.

H. Core Material at Sinks: medium-density fiberboard made with exterior glue or exterior-grade plywood.

I. Core Thickness: 3/4 inch.

1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.

J. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

K. Paper Backing: Provide paper backing on underside of countertop substrate.

2.2 WOOD MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.

1. Wood Moisture Content: 5 to 10 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Medium-Density Fiberboard: ANSI A208.2, Grade 130, made with binder containing no urea formaldehyde.

2. Softwood Plywood: DOC PS 1.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials complying 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.

1. Use treated materials that comply with requirements of referenced woodworking standard. Do not use materials that are warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, 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. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2.4 MISCELLANEOUS MATERIALS

A. Adhesives: Do not use adhesives that contain urea formaldehyde.

B. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. VOC Limits for Installation Adhesives and Sealants: Use products that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Structural Wood Member Adhesive: 140 g/L.

4. Architectural Sealants: 250 g/L.

2.5 FABRICATION

A. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.

B. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:

1. Solid-Wood (Lumber) Members: 1/16 inch unless otherwise indicated.

C. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Notify Architect seven days in advance of the dates and times woodwork fabrication will be complete.
2. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.

D. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.

B. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install countertops to comply with same grade as item to be installed.

B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
2. Seal edges of cutouts by saturating with varnish.

C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

1. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

D. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

E. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

F. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
3. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean countertops on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 123623.13

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SECTION 14 42 16

VERTICAL WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Unenclosed, self-contained vertical platform wheelchair lift.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Concrete shaftway and anchor placement.

B. Section 06100 - Rough Carpentry: Blocking in framed construction for lift attachment.

C. Section 09260 - Gypsum Board Assemblies: Gypsum board shaftway.

D. Division 16 - Electrical: Dedicated telephone service and wiring connections.

E. Division 16 - Electrical: Lighting and wiring connections at top of shaft.

F. Division 16 - Electrical: Electrical power service and wiring connections.

1.3 REFERENCES

A. ASME A17.1 - Safety Code for Elevators and Escalators.

B. ASME A17.5 - Elevator and Escalator Electrical Equipment.

C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.

D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.

E. NFPA 70 - National Electric Code.

1.4 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
   2. Include complete description of performance and operating characteristics.

C. Shop Drawings:
   1. Show typical details of assembly, erection and anchorage.
   2. Include wiring diagrams for power, control, and signal systems.
   3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.

D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finished product specified, two samples, minimum size 1-3/4" x 2-1/4", representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firm with minimum 10 years experience in manufacturing of vertical platform lifts, with evidence of experience with similar installations of type specified.

B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

1.6 REGULATORY REQUIREMENTS

A. Provide platform lifts in compliance with:
   1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
   2. ASME A17.1 - Safety Code for Elevators and Escalators.
   3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
   4. NFPA 70 - National Electric Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

A. Warranty: Manufacturer shall warrant the wheelchair lift materials and workmanship for two years following completion of installation.

B. Extended Warranty: Provide an extended manufacturer's warranty for the entire warranty period covering the wheelchair lift materials and workmanship for the following additional extended period beyond the initial one year warranty. Preventive Maintenance agreement required.
   1. Five additional years.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Garaventa Lift; United States - P.O. Box 1769, Blaine, WA 98231-1769. Canada - 7505 134A St., Surrey, BC V3W 7B3. ASD. Toll Free: 800-663-6556. Tel: (604) 594-0422. Fax: (604) 594-9915. Email: productinfo@garaventalift.com Web www.garaventalift.com

B. Substitutions: Permitted for equivalent machinery and configuration.

C. Requests for substitutions will be considered in accordance with provisions of Section 016000.

2.2 UNENCLOSED VERTICAL WHEELCHAIR LIFT

A. Capacity: 750 lbs (340 kg) rated capacity.

B. Mast Height:
   1. Model GVL-OP-42; 45 inches (1143 mm) maximum lifting height.

C. Platform Size and Nominal Clear Platform Dimensions:
   1. Large 90 degree: 43-1/2 inches (1104 mm) by 58-1/2 inches (1485 mm) with 90 degree entry/exit configuration.

D. Platform Configuration:
   1. 90 Degree: Front and side openings.

E. Landing Openings: Gates shall be self closing type.
   1. Gate Height: 42-1/8 inches (1070 mm).
   2. Platform Gate: Travels with platform and opens at lower landing.
   3. Upper Landing Gate: Installed at upper landing.

F. Power Gate Operators:
   1. Location:
      a. Platform Gate: Travels with platform and opens lower landing.
      b. Upper Landing Gate.
   2. Automatically opens the gate when platform arrives at a landing. Will also open at landing by pressing call button.
   3. ADA Compliant and obstruction sensitive.

4. Low voltage, 24 VDC with all wiring concealed.

G. Lift Components:
1. Machine Tower: Custom aluminum extrusion.
2. Base Frame: Structural steel.
3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet.
4. Platform Access Ramp: 12 gauge (2.5 mm) galvanized steel plates; slip resistant surfaces.
   a. Ramp: Stationary type.
   b. Ramp: Automatic folding type.
5. Side Guard Panels: 42-1/8 inches (1070 mm) high mounted on platform.
6. Outdoor Protection: Lift shall include modifications recommended by manufacturer for reliable performance in outdoor climate of project site.

H. Base Mounting at Lower Landing:
1. Floor Mount: Base of lift shall be mounted on the floor surface of the lower landing. For access onto the platform provide a ramp of 16 gauge (1.5 mm) galvanized steel sheet with a slip resistant surface.
2. Pit Mount: Lift to be mounted in pit with dimensions to meet manufacturers requirements for the platform size specified. Pit construction shall be in accordance to Section 03300.

I. Hydraulic Drive:
1. Drive Type: Chain hydraulic.
2. Emergency Operation: Manual device to lower platform and battery auxiliary power to raise or lower platform.
3. Safety Devices:
   a. Slack chain safety device.
   b. Shoring device.
4. Travel Speed: 17 fpm (5.2 m/minute).
5. Motor: 3.0 hp (2.2 kW); 24 volts DC.
6. Power Supply:
   a. 120 VAC single phase; 60 Hz on a dedicated 15 amp circuit.
   b. Powered by continuous building mains converted to 24 VDC, equipped with auxiliary power system capable of running lift up and down for a minimum of 5 trips with rated load.
   c. Powered by continuously charged battery system.

J. Platform Controls: 24 VDC control circuit with the following features.
1. Direction Control: Constant pressure rocker switch.
2. Direction Control: Illuminated tactile and constant pressure elevator-style buttons with dual platform courtesy lights and safety light.
3. Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm with battery backup.
4. Keyless operation.
5. Emergency Telephone: Platform shall be equipped with ADA compliant integrated telephone with a stainless steel faceplate. Telephone shall operate in the event of power failure. A telephone line shall be supplied to the lift site as specified under Division 16.

6. Arrival Gong and Digital Floor Display.

K. Call Station Controls: 24 VDC control circuit with the following features.
1. Direction Control:
a. Constant pressure rocker switch.
b. Illuminated tactile and constant pressure elevator-style buttons with dual platform courtesy lights and safety light.
2. Keyless operation.
3. Call Station Mounting:
a. Lower:
1) Wall mounted surface.
b. Upper:
1) Frame mounted.
2) Wall mounted surface.

L. Safety Devices and Features:
1. Grounded electrical system with upper, lower, and final limit switches.
2. Tamper resistant interlock to electrically monitor that the gate is in the closed position and the lock is engaged before lift can move from landing.
3. Pit stop switch mounted on mast wall.
4. Electrical disconnect shall shut off power to the lift.
5. Under platform safety pan with five waterproof safety switches to detect obstruction under platform.

M. Finishes
1. Aluminum Extrusions: Champagne anodized finish.
2. Ferrous Components: Electrostatically applied baked powder finish, fine textured.
a. Color: Satin Grey, RAL 7030.
3. Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify shaft and machine space are of correct size and within tolerances.

C. Verify required landings and openings are of correct size and within tolerances.

D. Verify electrical rough-in is at correct location.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install platform lifts in accordance with applicable regulatory requirements including ASME A 17.1, ASME A 18.1 and the manufacturer's instructions.

B. Install platform lifts in accordance with applicable regulatory requirements including CSA B355, and manufacturer's instructions.

C. Install system components and connect to building utilities.

D. Accommodate equipment in space indicated.

E. Startup equipment in accordance with manufacturer's instructions.

F. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A 17.1 or A18.1 and as required by authorities having jurisdiction.

B. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 21

FIRE SUPPRESION

SECTION 21.00.00

FIRE SUPPRESSION
(Filed Sub-Bid)

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

A. Include the General Conditions of the Contract and Division 1, General Requirements, as part of this Section.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work of this Section with that of all other trades affecting, or affected by, this Section. Cooperate with such trades to assure the steady progress of all work under the contract.

D. Materials or products specified herein and/or indicated on Drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified. Substitutions will not be permitted except as described herein and in the Supplementary and General Conditions.

E. All materials shall be new of quality as specified, and when required be clearly labeled and/or stamped as manufactured in the United States.

F. A list of all materials and equipment which the Installer proposes to furnish shall be submitted for approval within ten (10) days after the contract has been awarded. Data shall be complete in all respects.

G. Where an accepted substitution or deviation requires different quantity or arrangement of supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal to this equipment, Installer shall furnish said changes and additions and pay all costs for all changes and additions to his work and the work of others affected by this substitution or deviation.

H. Deviations mean the use of any listed approved manufacturer other than those on which the Drawings are based

1.2 FILED SUB-BID

A. The Fire Suppression filed sub-bid includes the Work specified in the following Sections.

1. 21 00 00, Fire Suppression

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority

E. The work of this Section is shown on Drawings FP-0.1, FPX-1.0, FPX-1.1, FP-1.0, and FP-1.1

1.3 SYSTEM DESCRIPTION / FIRE SUPPRESSION NARRATIVE

A. The following fire suppression narrative is provided to comply with the fire sprinkler portion of the requirements of Massachusetts State Building Code, 8th Edition, 780 CMR 901.2.1 paragraph 1 section a. (Other narratives shall be provided to comply with other fire protection related building systems and components.)

B. Building Description

1. The project consists of two additions to the existing building and reconfiguration of an office and classroom area.

   a. The first addition will be off the cafeteria and will be 1 story in height. The new addition is approximately 725 sq. ft. of floor area.

   b. The second addition will be to extend the class room wing and will consist of 6 additional classrooms, bathrooms and associated areas. This addition will be 2 stories in height and approximately 6,100 sq. ft. of floor area.

C. System Summary

1. The building is currently a fully sprinklered building. All additions will be fully sprinklered. All modifications will be made in compliance with NFPA 13 "Standard for the Installation of Sprinkler Systems" 2007 Edition.

D. Applicable Laws, Regulations and Standards

1. 780 CMR Massachusetts State Building Code, 7th Edition

2. NFPA 13 "Standard for the Installation of Sprinkler Systems" 2007 Edition

E. Design Methodology

1. Mechanical, electrical, crawl space and storage areas: Areas will be designed based on Ordinary Hazard Group 1, occupancy requirements. The design density will be 0.15 gpm/sq.ft. with a maximum sprinkler coverage of 130 sq.ft. Quick response type sprinkler heads shall be utilized.

   a. System shall be hydraulically designed per NFPA 13. Based on the "Room Design Method" per NFPA 13-2007 section 11.2.3.3.

2. Classrooms, Hallways and Offices: Areas will be designed based on Light Hazard occupancy requirements. The design density will be 0.1 gpm/sq.ft. with a maximum sprinkler coverage of 130 sq.ft. Quick response type sprinkler heads shall be utilized.

   a. System shall be hydraulically designed per NFPA 13. Based on the "Room Design Method" per NFPA 13-2007 section 11.2.3.3.

3. For system details see attached plans and specifications.

F. Sequence of Operation

1. Trouble sequence of operation: On circuit trouble places building fire alarm system in trouble mode, which causes the flowing system operations:

2. Annunciate zone on building fire alarm control panel.

3. Sprinkler Head Actuation: Actuation of a sprinkler head causes the following system operations:

4. Annunciate zone on building fire alarm control panel via flow switch located at building DCVA, (double-check valve assembly).

5. Tamper Switch and Low Pressure Switch: Actuation of a sprinkler valve tamper switch or low pressure supervisory switch causes the following system operations:

6. Annunciate supervisory signal for the valve tamper switch at the building fire control panel.

G. Testing

1. All testing shall be done at the expense of the contractor, who shall furnish the required equipment. Any and all system shutdowns must be coordinated with the Owners and the Engineer. Contractor shall provide 5 day notice of any shutdown.
2. System shall be tested in compliance with the requirements of NFPA 13 and local Fire Departments Requirements. All tests shall be conducted to the satisfaction of the engineer and owner.
3. The sprinkler system shall be tested hydrostatically for 2 hours without visible leakage at not less than 200 psi or at 50 psi in excess of the maximum static pressure, whichever is greater.
4. Contractor shall conduct a full flow test of the sprinkler system to ensure that water flow detecting devices and associated alarm circuits are working properly.
5. When testing is complete the system shall be returned to operation. The alarm receiving office and all concerned personnel at the facility shall be notified that the test is complete and that the system has been returned to full service.

1.4 SCOPE OF WORK

A. Included in this Section is the furnishing of all labor, materials, equipment and accessories required to provide a complete installation of the work described herein and on the Drawings. Build the work of other trades into the work of this Section as required.

1. Furnish and install an extension of the existing sprinkler system to serve the new additions as shown on plans and as required per NFPA 13 and local fire authorities having jurisdiction. System shall include but is not limited to the following:
2. The fire protection system shall be complete including permits and inspections. Bid shall include all costs associated with making a complete system.

B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities having jurisdiction, as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, all of which are part of Contract Documents.

C. The work under this Section consists of:

1. Working Plans
2. Sprinkler Heads
3. Pipe Materials
4. Valves
5. Hangers, Anchors and Inserts
6. Pipe Hangers and Supports
7. Seismic Restraint
8. Sleeves
9. Identification
10. Record drawings.
11. Flow test
12. Access panels

13. Fire stopping
14. Coordination with Fire Alarm installer
15. Permits fees
16. Submittals
17. Provide Close-Out procedures per Division 1.

1.5 ALTERNATES

A. Refer to Division 1. - Alternates for work that may affect the work of this Section.

1.6 RELATED WORK IN OTHER SECTIONS

A. The following work is not included in this Section and will be performed under other Sections:

1. Fire Alarm, 26 00 00

B. Proceed with work as fast as possible to meet all construction schedules. At all times keep a competent superintendent in charge of the work. Such superintendent shall be replaced if unsatisfactory to the Owner and/or Engineer.

C. Maintain a complete file of all contract and shop drawings at the site available for inspection by Owner's representatives.

D. Upon installation of equipment shop drawings shall be initialed and dated. This procedure will serve to ensure proper scheduling and enable Owner's representative's time to check the work in progress.

1.7 ITEMS SUPPLIED UNDER OTHER SECTIONS FOR INSTALLATION BY THIS SECTION

A. None.

1.8 ITEMS SUPPLIED UNDER THIS SECTION FOR INSTALLATION BY OTHER SECTIONS

A. Fire alarm components including tamper switches and flow switches, alarm bells shall be wired by the Electrical Contractor.

1.9 QUALITY ASSURANCE

A. Perform work in strict accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities having lawful jurisdiction, and be responsible for compliance therewith. Such authorities include but are not limited to the following:

1. Local and state building, plumbing, mechanical, electrical, fire and health department codes.
2. National Fire Protection Association (NFPA)
3. Occupational Safety and Health Act (OSHA)
4. Factory Mutual Association (FM)
5. Material and equipment shall be Underwriter's Laboratory (UL), ASME and AGA approved, as applicable, for intended service.

B. When two or more codes, regulations, etc. conflict with each other or with Contract Documents, the more severe requirement shall govern conduct of work. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction. Approval for such relaxation must be obtained in writing.

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. National Fire Protection Agency (NFPA)

1.10 SUBMITTALS

A. Submit the following in accordance with Conditions of the Contract and Division-1 Specification Sections.

B. Material and equipment requiring Shop Drawings or Product Data submittal shall include but shall not be limited to:

1. Piping, hangers, fittings, unions, flanges, and couplings.
2. Valves
3. Sprinkler heads
4. Escutcheons.
5. Supply access panels

C. Seismic Restraints: Submit shop drawings and calculations detailing seismic hanger restraint requirements to meet state and local codes along with a letter of compliance signed by a registered structural engineer confirming that the piping hangers meet State Seismic Code Requirements.

1. Provide Manufacturer's installation details.
2. Product Manufacturer's product data on strut channels including but not limited to types, finishes, gauge thickness and hole patterns. For each different cross-section submit cross sectional properties including section modulus and moment of inertia.

D. Submit working plans as defined by NFPA 13 for all floors. Plans shall be submitted for review by project team prior to submission to fire department. Plans shall also comply with the requirements of Tier Two shop drawings as defined by 780 CMR 901.2.1 paragraph 2.

E. Submit a line item schedule of values for review prior to equipment submittals for use in the requisition process.

F. Submit a schedule for the work in coordination with the G.C.'s schedule.

G. Submit lead-time requirements for any equipment with more than a three-week lead-time.

H. At substantial completion, prepare a set of as-built drawings per Division 1.

1.11 PERMITS, FEES AND INSPECTIONS

A. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work; file all permit applications required by all government departments having jurisdiction.

B. Obtain all required certificates of inspection for work and deliver them to the Engineer before requesting acceptance and final payment for the work.

C. The Installer shall inform the Engineer of any work or materials which conflict with any of the applicable codes, standards, laws and regulations for his trade before submitting his bids. No claims for corrections required for code compliance will be considered after bidding

1.12 INSTALLER QUALIFICATIONS

A. Each Installer performing work under any section of this division shall be a licensed firm regularly engaged in the type of work to be provided under these sections.

B. Each Installer shall be able to provide, upon request, a list of at least five (5) similar jobs he has completed in the last two (2) years.

1.13 GUARANTEES AND WARRANTIES

A. The provisions under Conditions of the Contract and Division 1 are included.

B. Guarantee work of this Section in writing for one year from date of Substantial Completion of the project. (Not just the sprinkler system)

1. Defects in materials, equipment, workmanship or installation that develop within this period shall be repaired and replaced promptly to Engineer's satisfaction at no cost to Owner.

2. Written guarantee shall stipulate that damage caused in making necessary repairs and replacements shall be corrected at no cost to Owner.

3. The sprinkler system shall be considered substantially complete only after all piping and heads have been installed, system is fully operational and the local AHJ has signed off on all components of the system.

C. Guarantee shall include provision of 24-hour service for complete system during guarantee period at no cost to Owner.

1. Choice of service organization shall be subject to Owner's approval.

D. Submit guarantee to Engineer through Contractor before final payment.

E. Transfer individual equipment and material guarantees, which are still in force to Owner at end of guarantee period.

F. Guarantee the system to be free from defective materials and workmanship for a period of one (1) year from date of Owner's acceptance. Guarantees and warranties for work under this contract to be delivered to the owner upon completion of his work.

G. Regulatory Requirements: Comply with the requirements of the following codes:

1. 780 CMR Massachusetts State Building Code, 8th Edition

2. NFPA 13 "Standard for the Installation of Sprinkler Systems" 2007 Edition

3. UL and FM Compliance: Fire protection system materials and components shall be Underwriter's Laboratories listed and labeled, and Factory Mutual approved for the application anticipated.

1.14 CONTRACT DOCUMENTS

A. Work to be performed under this Section is shown on the accompanying drawings.

B. Listing of drawings does not limit responsibility of determining full extent of work required by Contract Documents.

1. Refer to Architectural, Mechanical, Plumbing, Electrical, Structural and other drawings on file, as well as other specification sections, which indicate type of construction in which the work must be installed.

2. Locations shown on Drawings shall be checked against general and detailed drawings of the construction proper.

C. Drawings are diagrammatic and indicate general arrangements of systems and work included in Contract.

1. Drawings are not intended to specify or to show every offset, fitting, or component; however, Contract Documents require components and materials, whether or not indicated or specified, as necessary to make installations fully complete and operational.

2. Drawings are intended to show the general arrangement of the systems and not every sprinkler head, pipe, fitting and elbow required to make a functional system. FPC is responsible for providing additional sprinkler heads and piping as required to make a fully functional code compliant system.

D. Questions regarding drawings or specifications shall be addressed to the Engineer in writing prior to Award of Contract.

1. Otherwise, the Engineer's interpretation of meaning and intent of drawings and specifications shall be final.

1.15 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications indicate discrepancies or ambiguities, advise the Engineer in writing before Award of Contract.

1. Otherwise, the Engineer's interpretation of documents shall be final; no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.

B. Where drawings or specifications do not coincide with recommendations of manufacturer of material or piece of equipment, alert the Engineer in writing before installation of item in question.

1. Otherwise, make changes in installation, as the Engineer requires without additional cost to owner.

C. When specifications and drawings are in conflict with each other, or with Contract Documents, the more severe (costly) requirement shall be provided as part of the base bid work.

1. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction.

2. Approval for such relaxation must be obtained in writing.

1.16 DRAWINGS AND SPECIFICATIONS

A. It is the intent of Drawings and Specifications to obtain a complete and satisfactory installation. An attempt has been made to define the work of the Installer. Drawings are diagrammatic and should be followed as closely as actual construction of the building and the work of other trades may permit.

B. The Contractor shall accept full responsibility to complete all work which may be indicated on any of the Drawings or in any division of the Specification.

C. The Specifications and Drawings are complementary and are to be taken together for a complete interpretation of the work. Exceptions are those notes on the Drawings, that refer to an individual element or work, and take precedence over the Specifications where they conflict with same.

D. The Drawings utilize symbols and schematic diagrams to indicate various items of work. Therefore, no interpretation shall be made from the limitations of symbols and diagrams so that any elements necessary for a complete installation are excluded.

E. Certain details appear on the Drawings which are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility.

F. Examine the mechanical and electrical Drawings and Specifications and visit the job site prior to submitting bid. Some mechanical and electrical equipment may constitute obstructions and require additional heads to provide full coverage from what is shown on the plans. FPC is

responsible for identifying these conditions during bidding and including any additional heads which are required in their bid. No additional compensation will be approved.

G. Complete Coverage: The intent of the drawings is to provide complete coverage of all areas as required by code. FPC is responsible for identifying any missing heads which are required during bidding and including any additional heads and piping in their bid. No additional compensation will be approved.

H. The Engineer/Owner shall be notified of any discrepancies, omissions, conflicts or interferences which occur between Drawings and Specifications. If such notification is received in adequate time additional data or changes will be issued by addendum to all bidders.

I. In the event that extra work is authorized, and performed by this trade, work shown on drawings depicting such work, and/or described by addendum is subject to the base building specifications in all respects.

1.17 WORKING DRAWINGS

A. Submit working drawings as defined by NFPA 13, for review by Owner/Engineer before submitting plans to AHJ. Owner/Engineer shall review and comment and contractor shall modify plan accordingly. Then plans shall be submitted to AHJ for review. No equipment or material shall be ordered or installed prior to AHJ approval. Equipment or materials ordered or installed before review may not be accepted and will have to be removed from the project.

B. Working plans shall be drawn to an indicated scale, on sheets of uniform size, with a plan of each floor, and shall show those items from the following list that pertain to the design of the system:

1. Name of owner and occupant
2. Location, including street address
3. Point of Compass
4. Full height cross section, or schematic diagram, including structural member information if required for clarity and including ceiling construction and method of protection for nonmetallic piping
5. Location of partitions
6. Location of fire walls
7. Occupancy class of each area or room
8. Any small enclosures in which no sprinklers are to be installed
9. Size of city main in street and whether dead end or circulating; if dead end, direction and distance to nearest circulating main; and city main test results and system elevation relative to test hydrant
10. Other sources of water supply, with pressure or elevation
11. Make, type, model, and nominal K-factor of sprinklers including sprinkler identification number
12. Temperature rating and location of high-temperature sprinklers
13. Total area protected by each system on each floor
14. Number of sprinklers on each riser per floor
15. Pipe type and schedule of wall thickness
16. Nominal pipe size and cutting lengths of pipe (or center tocenter dimensions), Where typical branch lines prevail, it shall be necessary to size only one typical line
17. Location and size of riser nipples

18. Type of fittings and joints and location of all welds and bends, The contractor shall specify on drawing any sections to be shop welded and the type of fittings or formations to be used
19. Type and locations of hangers, sleeves, braces, and methods of securing sprinklers when applicable
20. All control valves, check valves, drain pipes, and test connections
21. Piping provisions for flushing
22. Where the equipment is to be installed as an addition to an existing system, enough of the existing system indicated on the plans to make all conditions clear
23. For hydraulically designed systems, the information on the hydraulic data nameplate
24. A graphic representation of the scale used on all plans
25. Name and address of contractor
26. Hydraulic reference points shown on the plan that correspond with comparable reference points on the hvdraulic calculation sheets
27. The minimum rate of water application (density), the design area of water application, in-rack sprinkler demand, and the water required for hose streams both inside and outside
28. The total quantity of water and the pressure required noted at a common reference point for each system
29. Relative elevations of sprinklers, junction points, and supply or reference points
30. If room design method is used, all unprotected wall openings throughout the floor protected
31. Calculation of loads for sizing and details of sway bracing
32. Size and location of hydrants, showing size and number of outlets and if outlets are to be equipped with independent gate valves. Whether hose houses and equipment are to be provided, and by whom, shall be indicated. Static and residual hydrants that were used in flow tests shall be shown
33. Size, location, and piping arrangement of fire department connections

C. The drawings shall show all apparatus such as valves, supports, access panels, pipe size, equipment, piping specialists and bottom elevations of each pipe.

D. Drawings shall become part of the final as-built records. Coordinate with mechanical, plumbing and electrical, drawings for available ceiling clearances. If a discrepancy is found, contact the Engineer for clarification before submitting drawings.

E. The Engineer's review does not relieve the Contractor of the responsibility to comply with all requirements of this Specification, codes and authorities having jurisdiction.

1.18 RECORD DRAWINGS

A. Provide Record and Drawings per Division 1 and requirements below.

B. As work progresses and for duration of Contract, maintain complete and separate sets of prints of Contract Drawings at job site at all times.

C. Record work completed and all changes from original Contract Drawings clearly and accurately. Record valve tags as they are installed.

D. Upon approval of drawings, print 3 full size sets and 2 half size sets; submit to Engineer.

E. "As-built" hydraulic calculations shall include all deviations from design drawings.

1.19 CUTTING AND PATCHING

A. Provide required sleeves, forms and inserts through existing walls, partitions, floors or roofs as required.

B. The cost of cutting and patching of walls, partitions, ceilings and floors and concrete inserts necessary for reception of this trade's work shall be the Contractor's responsibility.

C. When it becomes necessary to cut finished materials, submit to the Engineer for approval, drawings showing the work required and obtain approval before doing such cutting.

D. No structural members shall be cut without the previous written approval of the Engineer and the Owner

1.20 DEFINITIONS

A. Pipe sizes used in this Specification are Nominal Pipe Size (NPS).

B. Other definitions for fire protection systems are listed in NFPA Standards.

C. Working Plans as used in this Section means those documents (including drawings prepared pursuant to the requirements contained in NFPA 13 for obtaining approval of the authority having jurisdiction.

PART 2: PRODUCTS

2.1 MANUFACTURERS

A. Materials and equipment provided under this Section to make for a complete installation shall be U.L. listed and/or FM-approved and in compliance with NFPA Standards.

2.2 PIPING AND FITTINGS

A. Piping and all fittings shall comply with the most recent applicable ASTM Standard.

B. All the hose threads shall be National Standard.

C. Service: Risers and distribution piping.

1. Steel Pipe: ASTM A53, ASTM A135, or ASME B36.10, Schedule 10 or 40 black.
2. Steel Fittings: ASME B16.9, wrought steel, butt welded; ASME B16.25, butt weld ends; ASTM A234, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
3. Cast Iron Fittings: ASME B16.1, flanges and fittings; ASME B16.4, threaded fittings.
4. Malleable Iron Fittings: ASME B16.3, threaded type; ASTM A47.
5. Mechanical Grooved Couplings: Malleable iron housing, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
6. Steel Pipe: ASTM A53, ASTM A135, or ASTM A795, Schedule 5 black.
7. Steel Fittings: Cold drawn steel, mechanically attached, with butylene or EPDM O-ring.

2.3 AUTOMATIC SPRINKLER HEADS

A. Sprinkler Heads: Fusible link type, and style as indicated or required by the application and the coverage area as noted on the drawings. Unless otherwise indicated, provide heads with nominal one half inch (1/2") (15mm) discharge orifice, for "Ordinary" temperature range.

B. Sprinkler Head

1. Classrooms, Hallways and Occupied Areas

a. Provide Fusible link type, extended coverage style as indicated or required by the application. Unless otherwise indicated, provide heads with nominal one half inch (1/2") discharge orifice, for "Ordinary" temperature range.

b. Standard coverage area.

c. Finishes: Provide heads with the following finishes:

1) Recessed Pendant Style: Chrome finish.

2. Attics, Basement and other service areas.

a. Provide Fusible link type, extended coverage type as indicated or required by the application. Unless otherwise indicated, provide heads with nominal one half inch (1/2") discharge orifice, for "Ordinary" temperature range.

b. Standard coverage area.

c. Finishes: Provide heads with the following finishes:

1) Upright, Pendent, and Sidewall Styles: rough bronze finish

C. Heads shall be as manufactured by Tyco, Viking or Reliable.

2.4 SUPPORTS AND PLATES

A. Metal pipe supports, sway braces, hangers, clamps, and all other accessories shall be of an approved pattern and placed to conform to the requirements of NFPA.

B. Pipe passing through floors, walls and ceilings shall be provided with painted cast iron plates. Piping passing through smoke or fire partitions shall be sleeved and caulked with fire retarding material.

2.5 EXTRA MATERIALS

A. Valve Wrenches: Furnish to Owner, two (2) valve wrenches for each type of sprinkler head installed.

B. Sprinkler Heads and Cabinets: Furnish six (6) extra sprinkler heads of each style included in the project. Furnish each style with its own sprinkler head cabinet and special wrenches as specified in this Section

2.6 SEISMIC RESTRAINT

A. All Pipe hangers and equipment supports shall be constructed in accordance with Seismic Zone requirements as outlined in the Massachusetts State Building Code.

B. The contractor shall provide pre-engineered seismic restraint systems to meet total design lateral force requirements for support and restraint of piping systems where required. This contractor shall submit shop drawings and calculations detailing the requirements to meet state and local codes along with a letter of compliance signed by a registered structural engineer confirming that the piping hangers meet State Seismic Code Requirements.

C. Seismic Bracing and Support Systems:

1. Design analysis shall include calculated dead loads, static seismic loads and capacity of materials utilized for the connection of the equipment or system to the structure.

2. Analysis shall detail anchoring methods, bolt diameter and embedment depth.

3. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.

4. Friction from gravity loads shall not be considered resistance to seismic forces.

D. Cables provided for seismic shall be color coated and prestressed.

2.7 FIRE STOPPING

A. Pipe penetrations of fire rated walls and/or floors shall be sealed to maintain integrity of construction. All products. materials and methods of installation shall be UL approved and meet NFPA requirements.

B. Fire stopping of piping shall adhere to Section 701.1.5 of the "Standard Building Code"

C. Unless otherwise noted on drawings or modified by Engineer and/or authorities having jurisdiction, the following materials may be used:

1. Rock Wool: Minimum four (4) pounds per cubic foot density; flame spread fifteen (15), smoke developed zero (0), fuel contribution zero (0) by ASTM E84; minimum melting point 2000 degrees F.

2. Concrete and masonry are also approved firestop materials by NFPA 90A.

3. UL approved products such as Dow-Corning RTV Silicone Foam; 3M Fire Barrier.

D. UL, NFPA and manufacturer's recommendations shall be strictly followed.

E. Submit complete data on fire stopping materials and construction methods for review by Engineer before proceeding with work

2.8 SLEEVES

A. Sleeves Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors:

1. Pipes: Form with schedule 40 steel pipe

B. Sleeves for Pipe Through Non-fire Rated Floors:

1. Pipes: Form with schedule 40 steel pipe

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing:

1. Pipes: Form with schedule 40 steel pipe and seal with and UL listed fire stopping.

D. Piping passing through slab on grade shall not require sleeves.

E. Sleeves through outside walls shall be schedule 40 black steel pipe with 150 pound black steel slip-on welding flanges, welded at center of sleeve, painted with one coat of bitumastic paint inside and outside.

1. Space between sleeve and pipe shall be packed with oakum to within two inches of each wall face.

2. Remaining space shall be packed and made watertight with waterproof mastic.

F. Size sleeves two pipe sizes larger than pipe to allow for movement due to expansion and contraction.

G. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation.

H. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete

PART 3: EXECUTION

3.1 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of piping systems. Install piping as required.

1. Deviations from approved "Working Plans" for sprinkler piping, require written approval of the authority having jurisdiction. Written approval shall be on file with the Owner prior to deviating for the approved "Working Plans".

B. All piping shall be concealed unless otherwise noted on the drawings.

C. Install sprinkler piping to provide for system drainage in accordance with NFPA 13.

D. Use approved fittings to make all changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions in pipes two inches (2") and smaller, adjacent to each valve. Unions are not required on flanged devices or in piping installations using grooved mechanical couplings.

F. Install flanges on valves, apparatus, and equipment having two and one-half inch (2-1/2") and larger connections.

G. Hangers and Supports: In addition to the requirements specified in the Division 15 Section "Supports and Anchors", comply with the requirements of NFPA 13 and NFPA 14. Hanger and support spacing and locations for piping joined with grooved mechanical couplings shall be in accordance with the grooved mechanical coupling manufacturer's written instructions, for rigid systems.

H. Provide sleeve seal at pipe penetrations in exterior walls.

I. Install test connections sized and located in accordance with NFPA 13 complete with shutoff valve. Test connections may also serve as drain pipes if approved by local authorities having jurisdiction.

J. Install pressure gauge on the riser or feed main at or near each test connection. Provide gauge with a connection not less than one-fourth inch (1/4") and having a soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal.

3.2 PIPE JOINTS

A. Threaded Joints: Conform to ANSI B1.20.1, tapered pipe threads for field cut threads. Join pipe, fittings, and valves as follows.

1. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
2. Align threads at point of assembly.
3. Apply appropriate tape or thread compound to the external pipe threads.
4. Assemble joint to appropriate thread depth. When using a wrench on valves place the wrench on the valve end into which the pipe is being threaded.
5. Damaged Threads: Do not use pipe with threads which are stripped, chipped, corroded, or otherwise damaged. If a weld opens during cutting or threading operations, that portion of pipe shall not be used.

B. Flanged Joints: Align flanges surfaces parallel. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly to appropriate torque specified by the bolt manufacturer.

C. Mechanical Grooved Joints: Cut or roll grooves on pipe ends dimensionally compatible with the couplings.

D. End Treatment: After cutting pipe lengths, remove burrs and fins from pipe ends.

3.3 SPRINKLER HEAD INSTALLATIONS

A. Use proper tools to prevent damage during installations.

B. Where heads are installed in lay-in tile ceilings, mount heads in the center of tiles.

3.4 FIELD QUALITY CONTROL

A. Flush, test, and inspect sprinkler piping systems in accordance with NFPA 13.

B. Flush, test, and inspect standpipe systems in accordance with NFPA 14.

C. Replace piping system components which do not pass the test procedures specified, and retest repaired portion of the system.

3.5 PIPING AND VALVE IDENTIFICATION

A. Piping:

1. All piping shall, for the purpose of identification, be provided with either painted or taped color coded markers. Identification markers shall include letters designating the pipe service and have arrows indicating direction of flow.

2. Install markings after painting or insulation or pipe has been completed.

B. Valves:

1. Attach a two inch (2") (50mm) round brass tag stamped with designating numbers one inch (1") (25mm) high filled in with black enamel to each valve, except those in fixtures.

2. Securely fasten valve tag to valve spindle or handle with a brass chain.

C. Painting:

1. Paint red all piping exposed to view

3.6 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with other trades in executing work of this section as described hereunder.

1. Perform work so that progress of entire project including work of other trades whether involved in work of this or other Sections shall not be interfered with or delayed.

2. Provide information as requested on items furnished under this Section, which shall be installed under other Sections.

3. Obtain detailed information from manufacturers of equipment to be provided under this Section as to proper methods of installation.

4. Obtain final roughing dimensions or other information as needed for complete installation of all items furnished under other Sections or by Owner.

5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections.

a. Give full information so that openings required by work of this Section may be coordinated with other work and other openings may be provided for in advance.

b. In case of failure to provide necessary and sufficient information in proper time, trade involved will be required to do cutting and patching or have same done, at own expense and to full satisfaction of Engineer.

6. Notify Engineer of location and extent of existing piping and equipment, which interferes with new construction.

    a. In coordination with and with approval of Engineer, relocate such piping and equipment to permit new work to be provided as required by Contract Documents.

    b. With approval of Engineer, remove non-functioning or abandoned piping and equipment.

    c. If requested by Engineer, remove non-functioning or abandoned piping and equipment, which does not interfere with new work.

    d. Dispose of or store items as requested by Engineer.

7. Coordinate with other trades prior to installation of piping. If coordination does not occur then contractor shall be responsible for all costs associated with relocation of piping and equipment to allow for all trades to install equipment.

    a. If additional heads, piping or equipment is required due to lack of coordination than contractor shall provide additional heads, piping or equipment at no cost to the owner.

B. Maintenance of equipment and systems: Provide maintenance for fire protection equipment and systems until final acceptance by the Engineer and the Owner, and take such measures as necessary to ensure adequate protection of equipment and material during delivery, storage, installation and shutdown conditions.

1. This responsibility shall include provisions required to meet conditions incidental to delays pending final test of systems and equipment under seasonal conditions.

2. Use of Premises: Use of premises shall be restricted as directed by the Engineer and the Owner and as required below.

3. As required, during progress of work, remove and properly dispose of resultant dirt and debris, and keep premises reasonably clean.

    a. Upon completion of work, remove equipment and unused material provided for work, and 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 Engineer, and as specified in General Conditions.

4. Conduct work so as not to interfere with functioning of existing sewers and water mains.

    a. Extreme care shall be observed to prevent debris from entering piping. Confer with Engineer as to disruption of water service or other utilities due to testing or connection of new work to existing.

C. Superintendence: Keep superintendent or foreman on site during progress of work. Instructions given to such representative by Engineer shall be binding of Contractor.

1. Do not change representative without prior notification to Engineer.

D. Inspections by Engineer: Undertaking of periodic inspections by Engineer, Engineer, or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of manufacturer of equipment supplied.

E. Surveys and Measurements

1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.

2. In event of discrepancy between actual measurements and those indicated, notify Engineer in writing and do not proceed with work until written instructions have been issued by Engineer.

F. Firestopping and proofing:

1. Coordinate the work of this section with fire stopping provided by others for all new penetrations at fire rated partitions.

2. Fire stopping for all new penetrations at fire-rated partitions made by this contractor shall be provided by the GC.

3. Provide a marked plan set for reference by the GC indicating all penetrations that require fire stopping.

4. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to Owner.

3.7 MATERIALS AND WORKMANSHIP

A. Work shall be executed in workmanlike manner and shall present neat and mechanical appearance when completed.

1. Piping shall run concealed except in unfinished basement, mechanical rooms and areas where no finished ceiling exists.

2. Material and equipment shall be installed according to manufacturer's recommended best practice such that completed installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion, or water hammer.

3. Use of dielectric couplings between dissimilar materials is mandatory. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage prior to completion.

B. Fully insure workmen and work as required by law and General Conditions.

C. Except as otherwise noted, material or equipment mentioned in these Specifications or on Drawings shall be furnished new.

1. Provide supplies, appliances and connections necessary for complete and operational installation.

2. Equipment shall be provided with components required or recommended by OSHA and applicable NFPA documents, and shall be UL approved where applicable.

3. Protection facilities including expanded metal cloth guards over belt drives and couplings shall be provided in conformance with OSHA standards and all other applicable regulations.

D. Notwithstanding any reference in Specifications or on Drawings to material or piece of equipment by name, make or catalog number, such reference shall be interpreted as establishing type, function, and standard of quality desired and shall not be construed as limiting competition.

E. Finish of materials, components and equipment shall not be less than industry good practice.

1. When material or equipment is visible or subject to corrosive or atmospheric conditions, finish shall be as approved by Engineer.

F. Owner shall not be responsible for material and equipment prior to testing and acceptance.

3.8 SEISMIC RESTRAINT

A. All seismic restraint systems shall be installed in strict accordance with the manufacturer's guidelines.

B. Transverse piping restraints shall be at 40-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

C. Longitudinal restraints shall be at 80-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

D. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints.

E. Branch lines may not be used to restrain main lines.

F. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors and guides shall be installed as required to provide specified motion capability and limit motion of adjacent piping.

G. Do not brace a system to two independent structures such as ceiling and wall.

H. Provide appropriately sized openings in walls, floors and ceilings for anticipated seismic movement.

3.9 SLEEVES, PLATES, AND INSERTS

A. Lay out chases, openings and partitions before installation to permit coordinated installation. Coordinate with other trades.

1. Sleeves and inserts shall be set in forms before concrete is poured.
2. Sleeves set in floors or fire walls but not used in final installation shall be filled with concrete or grout flush with floor or wall to ensure proper fire stop.
3. Necessary sleeves in floors or fire walls not provided because of omission or change may be core drilled except where watertight sleeves are required.

B. Provide sleeves for piping between floors and through fire walls or smoke partitions. Provide approved packing between sleeves and piping to provide fire stop.

1. Piping passing through slab on grade shall not require sleeves.
2. Sleeves shall be 122 gauge or heavier steel, first pipe size or larger than outside diameter of pipe to be sleeved.

C. Sleeves through outside walls shall be schedule 40 black steel pipe with 150 pound black steel slip-on welding flanges, welded at center of sleeve, painted with one coat of bitumastic paint inside and outside.

1. Space between sleeve and pipe shall be packed with oakum to within two inches of each wall face.
2. Remaining space shall be packed and made watertight with waterproof mastic.

D. Watertight sleeves through floors shall be schedule 40 black steel pipe, set no less than one inch above finished floor surfaces.

E. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation.

1. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

3.10 ESCUTCHEONS

A. Escutcheons shall be installed around exposed pipe passing through finished floor, wall, ceiling, or cabinet.

1. Escutcheons shall be heavy cast brass, chromium-plated, unless otherwise noted, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe.

3.11 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas- and water-tight. Jointing shall be types specified for service indicated.

1. Joints and connections shall meet requirements of manufacturers best recommended practice.
2. All transitions between different piping materials shall be made using approved adapters.
3. Adapters for transitions between two types of piping materials shall be manufactured for purpose intended.

3.12 TESTING

A. Upon completion of the installation, the system will be hydrostatically tested and flushed as specified in NFPA 13.

B. All inspections and tests required by the authorities and agencies listed under "Design Standards" shall be arranged and paid for by the Installer. He shall deliver certificates of all such inspections to the architect before final payment if made.

END OF SECTION

DIVISION 22

PLUMBING

SECTION 22.00.00

PLUMBING
(Filed Dub-Bid)

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

A. Include the General Conditions of the Contract and Division 1, General Requirements, as part of this Section.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work of this Section with that of all other trades affecting, or affected by, this Section. Cooperate with such trades to assure the steady progress of all work under the contract.

1.2 FILED SUB-BID

A. The Plumbing filed sub-bid includes the Work specified in the following Sections.

1. 220000, Plumbing

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority

E. The work of this Section is shown on Drawings P-0.1, PX-1.0, PX-1.1, P-1.0, P-1.1, P-1.2, and P-2.1.

F. Sub-Sub-Bid Requirements:

1. Sub-bidder's attention is directed to Massachusetts GL Chapter 149, Section 44H as amended, which provides in part as follows.

2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the Section of the Specifications for that sub-trade) required such listing; provided that,- in the absence of a contrary provisions in the Specifications, any sub- bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub- bidder, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified so to do. This Section requires that the following class(es) of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Drawing Reference

Insulation P-0.1, PX-1.0, PX-1.1, P-1.0, P-1.1, P-1.2, and P-2.1

1.3 SCOPE OF WORK

A. Included in this Section is the furnishing of all labor, materials, equipment and accessories required to provide a complete installation of the work described herein and on the Drawings. Build the work of other trades into the work of this Section as required.

B. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities having jurisdiction, as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, all of which are part of Contract Documents.

C. The work under this Section consists of:

1. Selective demolition
2. Pipe Materials
3. Roof drains and conductor piping
4. Plumbing Fixtures
5. Pipe Protection
6. Thermostatic Tempering Valve
7. Hangers, Anchors and Inserts
8. Pipe Hangers and Supports
9. Pipe Insulation
10. Valves
11. Water Hammer (Shock) Arresters
12. Sleeves
13. Jointing Compounds
14. Identification
15. Access panels
16. Provide Close-Out procedures per Division 1.

1.4 ALTERNATES

A. Refer to Division 1. - Alternates for work that may affect the work of this Section.

1.5 RELATED WORK IN OTHER SECTIONS

A. The following work is not included in this Section and will be performed under other Sections:

1. Selective Demolition, Section 024119
2. Fire Protection, Section 210000
3. HVAC, Section 230000
4. Electrical, Section 260000

1.6 ITEMS SUPPLIED UNDER OTHER SECTIONS FOR INSTALLATION BY THIS SECTION

A. None.

1.7 ITEMS SUPPLIED UNDER THIS SECTION FOR INSTALLATION BY OTHER SECTIONS

A. Access Panels.

1.8 QUALITY ASSURANCE

A. Perform work in strict accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities having lawful jurisdiction, and be responsible for compliance therewith. Such authorities include but are not limited to the following:

1. Local and state building, plumbing, Mechanical, electrical, fire and health department codes.
2. 248 CMR Fuel Gas and Plumbing Code
3. International Energy Conservation Code (IECC 2009)
4. National Fire Protection Association (NFPA)
5. Occupational Safety and Health Act (OSHA)
6. Factory Mutual Association (FM)
7. Material and equipment shall be Underwriter's Laboratory (UL), ASME and AGA approved, as applicable, for intended service.

B. When two or more codes, regulations, etc. conflict with each other or with Contract Documents, the more severe requirement shall govern conduct of work. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction. Approval for such relaxation must be obtained in writing.

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. National Fire Protection Agency (NFPA)

1.9 SUBMITTALS

A. Provide submittals in accordance with Conditions of the Contract and Division-1 Specification Sections.

B. Material and equipment requiring Shop Drawings or Product Data submittal shall include but shall not be limited to:

1. Fixtures.
2. Fixture Hangers.
3. Piping, hangers, fittings, unions, flanges, and couplings.
4. Valves.
5. Insulation.
6. Escutcheons.
7. Clean-outs.
8. Access Panels

C. Submit manufacturer's installation instructions, service manuals, and parts lists under applicable provisions.

D. Submit a line item schedule of values for review prior to equipment submittals for use in the requisition process.

E. Submit a schedule for the work in coordination with the G.C.'s schedule.

F. Submit Massachusetts product approval for all plumbing and gas related products.

G. At substantial completion, prepare a set of as-built drawings per Division 1.

1.10 GUARANTEES AND WARRANTIES

A. The provisions under Conditions of the Contract and Division 1 are included.

B. Guarantee work of this Section in writing for one year from date of Substantial Completion.

1. Defects in materials, equipment, workmanship or installation that develop within this period shall be repaired and replaced promptly to Engineer's satisfaction at no cost to Owner.

2. Written guarantee shall stipulate that damage caused in making necessary repairs and replacements shall be corrected at no cost to Owner.

3. The plumbing system shall be considered substantially complete only after all fixtures are installed, functional and cleaned.

C. Guarantee shall include provision of 24-hour service for complete system during guarantee period at no cost to Owner.

1. Choice of service organization shall be subject to Owner's approval.

D. Submit guarantee to Engineer through Contractor before final payment.

E. Transfer individual equipment and material guarantees, which are still in force to Owner at end of guarantee period.

1.11 CONTRACT DOCUMENTS

A. Work to be performed under this Section is shown on the accompanying drawings.

B. Listing of drawings does not limit responsibility of determining full extent of work required by Contract Documents.

1. Refer to Architectural, Plumbing, Electrical, Structural and other drawings on file, as well as other specification sections, which indicate type of construction in which the work must be installed.

2. Locations shown on Drawings shall be checked against general and detailed drawings of the construction proper.

C. Drawings are diagrammatic and indicate general arrangements of systems and work included in Contract.

1. Drawings are not intended to specify or to show every offset, fitting, or component; however, Contract Documents require components and materials, whether or not indicated or specified, as necessary to make installations fully complete and operational.

D. Questions regarding drawings or specifications shall be addressed to the Engineer in writing prior to Award of Contract.

1. Otherwise, the Engineer's interpretation of meaning and intent of drawings and specifications shall be final.

1.12 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications indicate discrepancies or ambiguities, advise the Engineer in writing before Award of Contract.

1. Otherwise, the Engineer's interpretation of documents shall be final; no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.

B. Where drawings or specifications do not coincide with recommendations of manufacturer of material or piece of equipment, alert the Engineer in writing before installation of item in question.

1. Otherwise, make changes in installation, as the Engineer requires without additional cost to owner.

C. When specifications and drawings are in conflict with each other, or with Contract Documents, the more severe (costly) requirement shall be provided as part of the base bid work.

1. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction.

2. Approval for such relaxation must be obtained in writing.

PART 2: PRODUCTS

2.1 PIPE MATERIALS

A. Service: Above-ground hot and cold water.

1. Pipe Material: Type L copper tubing, hard temper.

a. Pipe shall comply with ASTM B-88

2. Fitting Material: Wrought copper conforming to ANSI-ASME B16-22.

3. Joints: Solder, "lead free" (less than 0.2% lead). NSF cert. ASTM B-32

B. Service: Belowground hot and cold water

1. Pipe Material: Type K copper tubing, hard temper.

a. Pipe shall comply with ASTM B-88

2. Fitting Material: Wrought copper.

3. Joints: Solder, "lead free" (less than 0.2% lead). NSF cert. ASTM B-32

C. Service: Above-ground Sanitary, Storm and Vent.

1. 2" and larger

a. Pipe Material: Service weight cast iron no-hub soil pipe conforming to CISPI 301 and ASTM A-888.

b. Fitting Material: Cast iron drainage fittings conforming to CISPI 301 and ASTM A-888.

c. Joints:

1) Standard shielded coupling with gasket conforming to CISPI 310 and ASTM C1277.

2. Smaller than 2"

a. Pipe Material: Type DWV copper conforming to ASTM B306-99.

b. Fitting Material: wrought copper drainage fittings conforming to ANSI B16-29.

c. Joints: threaded or soldered.

D. Service: Below-ground Sanitary, Storm and Vent.

1. Pipe Material: Service weight cast iron no-hub soil pipe, asphalt or coal tar pitch coated. ASTM A-74

2. Fitting Material: Cast iron drainage fittings conforming to CISPI 301 and ASTM A-888.

3. Joints: Heavy-duty gasket conforming to CISPI 310 and ASTM C1277.

2.2 PLUMBING FIXTURES

A. Work includes, but is not limited to, the following fixtures, See schedule on associated drawings.

1. Water Closets.

2. Urinals

3. Lavatories, faucets, and drains.

4. Sinks, faucets, and drain/strainer.

B. REFERENCES

1. ANSI A112.6.1 - Supports for Off-the-Floor Plumbing Fixtures for Public Use.

2. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.

C. QUALITY ASSURANCE

1. Fixtures: By the same manufacturer for each product specified throughout.

2. Trim: By the same manufacturer for each product specified throughout.

D. ACCEPTABLE MANUFACTURERS

1. American Standard;

2. Gerber;

3. Kohler;

4. Manufacturers as listed in the plumbing fixture schedule or approved equal.

E. INSPECTION

1. Confirm location and size of fixtures and openings before rough-in and installation.

2. Verify that adjacent construction is ready to receive rough-in work of this Section.

F. INSTALLATION

1. Install each fixture with trap, easily removable for servicing and cleaning.

2. Provide chrome plated rigid or stainless steel flexible supplies to lavatories with key stops, reducers, and escutcheons.

3. Provide drain, trap, and strainer at lavatories.

4. Install components level and plumb.

5. Install and secure fixtures in place with wall supports and bolts.

6. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07900, color to match fixture.
7. Mount fixtures according to dimensions shown on Architectural drawings

G. ADJUSTING AND CLEANING

1. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.
2. At completion, clean plumbing fixtures and equipment.

H. FIXTURE SCHEDULE

1. See schedule printed on drawings.
2. The products listed in the schedule establish the minimum quality and performance standard for each fixture, and the materials used in their manufacture.

I. FIXTURE HANGERS AND SUPPORTS

1. Certain fixtures require the use of a concealed, matching fixture hanger.
   a. Provide hangers as manufactured by Zurn, Smith, Watts, or approved equivalent for wall mount lavatories.
2. Pay close attention to dimensional requirements with respect to wall thicknesses and to wall construction type. Coordinate with the GC prior to start of wall construction.
   a. Select the proper hanger based on fixture type, installation conditions and requirements.
3. Pay close attention to the requirements shown on Architectural drawings for individual fixture mounting height and location.

2.3 POINT OF USE THERMOSTATIC TEMPERING VALVE

A. Provide point of use thermostatic tempering valve at each lavatory fixture. (For bathrooms with more than one lavatory one tempering valve may be used to serve multiple fixtures.)

B. The valve shall be ASSE 1070 certified for Point of Use Applications.

C. Valve body shall be of bronze and stainless steel construction with Teflon coated wear surfaces.

D. Valve shall reduce mixed flow rate in the event of cold supply line failure.

E. Valve shall have integral check valves on the inlet, or check valves shall be field installed.

F. Calibrate valve to deliver 90°F water.

G. Tempering valve shall be UMV series as manufactured by Honeywell or equivalent by Watts or Conbraco.

2.4 PIPE PROTECTION

A. ADA-conforming, wheelchair accessible lavatories and sinks shall be provided with under sink protective pipe covers that are intended to minimize risk of scalding from hot surfaces or abrasions from sharp surfaces.

B. All exposed plumbing, including P-trap and angle valve assemblies, shall be fitted with molded vinyl covers. Cover shall be constructed of 1/8" thick, anti-microbial vinyl and include UV resistant coating.

C. Covers shall be secured with non-abrasive, reusable fasteners to allow convenient servicing.

D. Cover to be selected by architect from manufactures standard color chart. Include color selection chart with submittal.

E. Pipe covers shall be Lav-Guard2 as manufactured by Truebro, Inc, or approved equal as manufactured by Plumberex or McGuire.

2.5 HANGERS, ANCHORS, AND INSERTS

A. Provide hangers to support all piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place, and provide for expansion and contraction. Hangers shall be secured to inserts wherever practical.

B. Hangers shall be adjustable clevis hanger type.

1. Hanger rods shall have machine threads.

C. Vertical brackets shall be used where horizontal piping is racked along walls. Trapeze hangers may be used where conditions permit.

1. Hangers for insulated piping shall be outside insulation with 12 inch long galvanized insulation shields.

D. Hanger rods shall be connected to beam clamp, UL approved concrete inserts, or Phillips or approved equal expansion shields as required to attach to the building construction.

1. No ram-set or shot shields will be allowed.

E. Hanger spacing shall conform to requirements of state and local plumbing codes.

1. In no case shall horizontal piping be supported at intervals greater than 10 ft.- 0 in.

F. Piping below basement or lowest level slab (that is, buried piping) need not be supported from structure if slab is not designed as structural slab.

2.6 PIPE HANGERS AND SUPPORTS

A. Uninsulated pipes 2 inch and smaller:

1. Adjustable steel swivel ring (band type) hanger.
2. Adjustable steel swivel J-hanger.
3. Malleable iron ring hanger or hinged ring hanger.
4. Malleable iron split-ring hanger with eye socket.
5. Adjustable steel clevis hanger. (MSS Type 1)

B. Uninsulated pipes 2-1/2 inch and larger:

1. Adjustable steel clevis hanger.
2. Pipe roll with sockets.
3. Adjustable steel yoke pipe roll.

C. Insulated pipe- Hot water piping:

1. 2 inch and smaller pipes:
   a. Adjustable steel clevis with galvanized sheet metal shield.
2. 2-1/2 inch and larger pipes:

a. Adjustable steel yoke pipe roll with pipe covering protection saddle.

b. Pipe roll with sockets with pipe covering protection saddle.

3. Hangers must be sized for outside diameter of pipe insulation.

D. Insulated pipe- Cold water piping:

1. 5 inch and smaller pipes:

a. Adjustable steel clevis with galvanized sheet metal shield.

2. 6 inch and larger pipes:

a. Pipe roll with sockets with pipe covering protection saddle.

b. Adjustable steel yoke pipe roll with pipe covering protection saddle.

3. Hangers must be sized for outside diameter of pipe insulation.

E. Pipe Clamps

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts. For insulated lines use double bolted pipe clamps.

F. Multiple or Trapeze Hanger

1. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8 inch by 1-5/8 inch minimum or stronger as required.

2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe.

G. For pipes subjected to axial movement:

1. Strut mounted roller support. Use pipe protection shield or saddles on insulated lines.

2. Strut mounted pipe guide.

H. Wall Supports

1. Pipes 4 inch and smaller:

a. Carbon steel hook.

b. Carbon steel J-hanger.

2. Pipes larger than 4 inch:

a. Welded strut bracket and pipe straps.

b. Welded steel brackets, with roller chair or adjustable steel yoke pipe roll. Use pipe protection shield or saddles on insulated lines.

I. Floor Supports

1. Hot piping under 6 inch and all cold piping:

a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. Pipe saddle shall be screwed or welded to appropriate base stand.

2. Hot water piping 6 inch and larger:

a. Roller stand with base plate

b. Adjustable roller support and steel support sized for elevation.

J. Vertical Supports

1. Steel riser clamp sized to fit outside diameter of pipe.

K. Copper Tubing Supports

1. Hangers shall be sized to fit copper tubing outside diameters.
2. Adjustable steel swivel ring (band type) hanger.
3. Malleable iron ring hanger or hinged ring hanger.
4. Malleable iron split-ring hanger with eye socket.
5. Adjustable steel clevis hanger.
6. For supporting vertical runs use epoxy painted or plastic coated riser clamps,.
7. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing or plastic inserted vibration isolation clamps.

L. Insulation Shields:

1. 18 gage galvanized steel shield over insulation to cover the lower 180 degree of pipe, minimum 12 inches long centered on pipe support.

M. Pipe Protection Saddles

1. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

N. Hanger Finishes

1. Indoor Finishes

   a. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint. Additional PVC coating of the epoxy painted hanger shall be used where necessary.

   b. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633.

   c. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 or have an electro-deposited green epoxy finish.

2. Outdoor and Corrosive Area Finishes

   a. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor use.

2.7 CLEANOUT

A. Cleanouts shall be provided in soil and waste piping at change in directions, at the foot of stacks where required by inspecting authorities and at other points so that lines will be readily accessible for cleaning or rodding out. Cleanouts shall suit construction in which they are to be installed.

B. Maximum horizontal distance between cleanouts in piping 4 inches in diameter and smaller shall be not more than 50 feet apart.

C. Cleanouts shall be same size as pipe installed, up to 4 inches in diameter. For piping larger than 4 inches in diameter, cleanouts shall be not less than 4 inches in diameter.

D. Bodies of cleanout ferrules in bell and spigot piping shall be standard pipe sizes conforming in thickness to that required for pipe and fittings, and shall extend not less than 3/4 inch above hub of pipe.

1. Cleanout plug shall be of cast brass and shall be provided with raised nut 3/4 inch high.
2. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of same size at line.
3. Cleanouts in threaded waste piping shall be cast iron, drainage T pattern, 90 degree branch fitting with extra heavy brass screw plugs of same size as pipe.

E. Cleanouts shall be installed so that cleanout opens in direction of flow of drainage line served or at right angles thereto.

F. Cleanout plug shall be kept free of dirt and construction materials and shall not be covered with cement, plaster, or other permanent finishing materials.

G. Floor cleanouts in finished areas shall be cast iron body and frame with round adjustable scoriated secured nickel bronze top, J. R. Smith No. 4020 or approved equal.

H. Floor cleanouts in unfinished areas shall be cast iron body and frame with round adjustable scoriated secured cast iron top, J. R. Smith No. 4220 or approved equal

2.8 PIPE INSULATION

A. Pipes shall be insulated as follows.

B. Fiberglass Insulation shall be: Fibrous glass insulation with factory-applied fire retardant vapor barrier jacket with K factor of 0.27 at 75 degrees F mean temperature; by Owens-Corning, Certain-Teed, Manville or approved equal, unless otherwise specified.

C. Insulation, jackets and adhesives shall be flame retardant. Fire and smoke Hazard ratings to be as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding:

Flame Spread	25
Smoke Developed	50

MINIMUM INSULATION THICKNESS SCHEDULE

APPLICATION	NOMINAL PIPE SIZE			
	< 1”	1” to 1-½”	1-½” to <4”	4” to 8”
Domestic Cold Water	½"	½"	½"	½"
Domestic Hot Water Supply	1”	1”	1”	1"
Domestic Hot Water Return	1”			
Roof Drain Conductors	½”			

D. Fittings shall be insulated by using pre-formed insulation fittings.

E. All insulation to include continuous vapor barrier.

F. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved

packing between sleeves and piping, to provide firestop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted.

G. Install materials in accordance with manufacturer's instructions.

H. Install materials only after piping has been tested and approved.

I. Use glues and tapes that are from the same manufacturer as the insulation itself. Install per manufacturers recommendations. Provide separate submittal for these products.

J. In exposed piping, locate insulation and cover seams in least visible locations. Seal to be continuous.

K. Insulate all fittings, valves, and unions.

L. Pipe hangers shall be external to all pipe insulation.

M. Insulation by a firm regularly specializing in this work and employing workers particularly skilled therein shall install insulation.

1. No covering applied by plumber's helpers will be acceptable.

2.9 ROOF DRAINS

A. Provide roof drain assembly

B. Assembly shall include galvanized cast iron dome, reversible threaded collar, cast iron drain body with membrane clamp and adjustable extension.

C. Drains shall include:

1. 18 ga. Galvanized steel sump receiver plate.

2. Underdeck clamp and hardware to secure

D. Roof drains as manufactured by JR Smith, or Josam or Zurn.

2.10 POTABLE WATER VALVES

A. Isolation valves (2" and smaller)

1. Provide bronze two-piece, ¼ turn, full port ball valve with chrome-plated brass ball, blowout proof stem and lever handle.

2. Valve shall have PTFE seats and stem packing seal.

3. Rated for 600 PSIG WOG service.

4. Provide extended valve stems where insulation thickness is greater than 1" or where handle movement is impeded by insulation.

5. As manufactured by Apollo, Watts, Jenkins or approved equal.

B. Check valves (2" and smaller)

1. Provide spring type check valves with bronze body, conical brass disc, and threaded connections. Spring and guide bushing shall be stainless steel.

2. Valve shall have PTFE seat.

3. Rated for 400 PSIG WOG service

4. As manufactured by Watts, or approved equal.

C. Fixture stop valves

1. Provide ¼ turn, chrome plated brass ball valve fixture stop valves.

2. Valve shall have brass ball and PTFE seats.

3. Provide angle or straight pattern to best match rough plumbing
4. Valve shall be as manufactured by Brass Craft, Chicago, McGuire or approved equal.

D. Balancing Valves (DHWR 1/2")

1. Circuit balancing valves to have two ¼" NPT brass metering ports with internal check valves and gasketed caps located on each side of the valve seat.
2. Valves are to be calibrated ball valve type and provide three functions:
   a. Precise flow measurement
   b. Precision flow balancing
   c. Positive drip tight shut-off
3. Valve hand-wheel shall have memory stop feature to provide a means for locking the valve position after the system is balanced.
4. Valve shall have a calibrated nameplate to indicate valve position.
5. Valve body shall be bronze with threaded or soldered pipe connections.
6. Ball shall be brass with reinforced TFE seat rings.
7. Balancing valves to be CB series by Bell & Gossett, or Armstrong, or Taco.

E. Balancing Valves (3/4" and larger)

1. Circuit balancing valves to have two ¼" NPT brass metering ports with Nordel check valves and gasketed caps located on both sides of valve seat.
2. Two additional ¼" NPT connections with brass plugs are to be provided on the opposite side of the metering ports for use as drain connections.
3. Drain connections and metering ports are to be interchangeable to allow for measurement flexibility when the valves are installed in tight locations.
4. Valves are to be "Y" pattern, modified, equal percentage globe style and provide three functions:
   a. precise flow measurement
   b. precision flow balancing
   c. positive drip tight shut-off
5. Valve shall provide multi-turn, 360-degree adjustment with a micrometer type indicator located on the valve hand-wheel.
6. Valve hand-wheel shall have hidden memory feature to provide a means for locking the valve position after the system is balanced.
7. Ninety-degree turn adjustable valves are not acceptable.
8. Valve body shall be bronze (<3% lead)) with ultra high strength engineered resin plug.
9. Plug shall have precision-contoured channels to distribute flow uniformly across valve seat.
10. Valve stem shall be bronze; hand-wheel and sleeve shall be high strength resin.
11. Valves shall have a minimum of four complete 360-degree hand-wheel turns.
12. Balancing valves to be Armstrong, MEPCO, or Tour & Andersen.

2.11 SLEEVES

A. Sleeves Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors:

1. Pipes: Form with schedule 40 steel pipe

B. Sleeves for Pipe Through Non-fire Rated Floors:

1. Pipes: Form with schedule 40 steel pipe

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing:

1. Pipes: Form with schedule 40 steel pipe and seal with and UL listed fire stopping.

D. Sleeves for Pipes penetrating slab on grade floors:

1. Pipes: Form with schedule 40 steel pipe
2. Cover piping with 1" foam insulation to avoid direct contact with concrete

E. Sleeves through outside walls shall be schedule 40 black steel pipe with 150 pound black steel slip-on welding flanges, welded at center of sleeve, painted with one coat of bitumastic paint inside and outside.

1. Space between sleeve and pipe shall be packed with oakum to within two inches of each wall face.
2. Remaining space shall be packed and made watertight with waterproof mastic.

F. Size sleeves two pipe sizes larger than pipe to allow for movement due to expansion and contraction.

G. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation.

H. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete

2.12 JOINTING COMPOUNDS

A. Provide pipe dope, Teflon tape, wax rings, neoprene gaskets and other jointing compounds as required by best standard practice and only on service as recommended by manufacturer.

B. Work shall conform to manufacturer's recommendations with regard to use of putties, jointing compounds or both in installing plumbing fixtures and trim.

2.13 IDENTIFICATION

A. Provide identification of all new plumbing systems. Colors per ANSI/ASME A13.1 unless otherwise specified.

B. Equipment: Numerically label multiple pieces of equipment (i.e., pumps, etc.) with plastic nameplates or stencil painting

C. Valves: Identify major valves in main and branch piping and risers with embossed brass tags. Provide matching valve chart.

D. Piping: Identify piping with plastic tape markers.

1. Identify service, and flow direction.
2. Install in clear view and align with axis of piping.
3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction.

E. Provide valve chart and schedule for inclusion in three-ring project manual.

2.14 ACCESS PANELS

A. Supply for Installation by GC access panels for concealed serviceable/replaceable plumbing components.

1. At a minimum provide access panels for shock arrestors, balancing valves and any concealed other valves, trap primers, indirect waste connections, cleanouts and drain plugs.

B. The Contractor shall determine the quantity and size of access panels to provide reasonable access for maintenance. No access panel shall be smaller than 8x8. Access panel size and location shall be subject to engineers review.

C. Access Doors: Subject to compliance with the requirements specified herein, manufacturers offering similar products include the following, or equal:

1. Cesco Products, North Brooklyn Park, NY
2. Nystrom Products Company, Minneapolis MN.
3. Milcor, Inc., Lima OH.
4. Larson Manufacturing Co., Brookings SD.

D. Access Panels – For Fire Resistance Rated Construction: For fire-resistance rated wall and ceiling surfaces: Standard flush panel door meeting the following requirements:

1. Panel and frame rating: UL "8" label for 90 minutes.
2. Frame Type:
   a. For gypsum board and veneer plastered walls and ceilings: 16 gauge galvanized bonderized steel frame, with 22 gauge galvanized steel d~911 bead.
      1) Nystrom IP series.
   b. For plastered walls and ceilings: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel plaster bead.
      1) Nystrom IP series.
3. Door: Insulated Flush panel door follows:
   a. Typical wall types: Flush door, Sandwich construction with 2 inch thick mineral wool fiber insulation between two layers of 20 gage galvanized bonderized steel.
4. Hinge: Flush continuous piano hinge with stainless steel pin.
5. Closer: Spring closer.
6. Latch/lock:
   a. Flush cam latch, operated by Allen or Torx head screwdriver.
7. Emergency latch release: For ceiling panels and wall panels accessible from the back which are greater than 18 by 18 inches in size, provide an interior latch release mechanism to permit panel to be opened from back (interior side) of panel.

E. Access Panels – For Non-Rated Construction, Non-Public Areas: For non-rated wall and ceiling surfaces (service and non-public areas): Flush panel door type meeting the following requirements:

1. Frame Type:

a. For gypsum board and veneer plastered walls and ceilings: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead.

1) Karp KDW series.

2) Nystrom NW series.

3) Williams WB-PL series.

2. Door: Flush panel door as follows:

a. Typical all wall types, except tile: 14 gage galvanized bonderized steel.

3. Hinge:

a. Typical: Concealed spring hinge enabling door to open 175 degrees and permit removal of door from frame.

b. Panels greater than 24 by 36 inches: Flush continuous piano hinge with stainless steel pin.

4. Latch/lock:

a. Flush cam latch, operated by Allen or Torx head screwdriver.

b. Emergency latch release: For ceiling panels and wall panels accessible from the back which are greater than 18 by 18 inches in size, provide an interior latch release mechanism to permit panel to be opened from back (interior side) of panel.

F. Access Panels For Non-Rated Construction, Public Areas: For non-rated gypsum board and veneer plastered walls and ceilings (Public areas): Recessed door type meeting the following requirements:

1. Manufacturer's types:

a. Karp DSC-210PL series.

b. Nystrom RP series.

c. Williams WB-ATP series.

2. Frame type: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel plaster bead with expanded lath.

3. Door: Recessed 16 gage galvanized bonderized steel door, with self-furring 3.4 pound galvanized steel lath welded to door.

4. Hinge: Concealed pivot rod hinge.

5. Latch/lock:

a. Flush cam latch, (operated by screwdriver) with plastic grommet.

6. Emergency latch release: For ceiling panels and wall panels accessible from the back which are greater than 18 by 18 inches in size, provide an interior latch release mechanism to permit panel to be opened from back (interior side) of panel.

G. Panels fabricated from galvanized bonderized steel: Baked on rust inhibitive gray primer finish

PART 3: EXECUTION

3.1 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with other trades in executing work of this section as described hereunder.

1. Perform work so that progress of entire project including work of other trades whether involved in work of this or other Sections shall not be interfered with or delayed.

2. Provide information as requested on items furnished under this Section, which shall be installed under other Sections.

3. Obtain detailed information from manufacturers of equipment to be provided under this Section as to proper methods of installation.

4. Obtain final roughing dimensions or other information as needed for complete installation of all items furnished under other Sections or by Owner.

5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections.

   a. Give full information so that openings required by work of this Section may be coordinated with other work and other openings may be provided for in advance.

   b. In case of failure to provide necessary and sufficient information in proper time, trade involved will be required to do cutting and patching or have same done, at own expense and to full satisfaction of Engineer.

6. Notify Engineer of location and extent of existing piping and equipment, which interferes with new construction.

   a. In coordination with and with approval of Engineer, relocate such piping and equipment to permit new work to be provided as required by Contract Documents.

   b. With approval of Engineer, remove non-functioning or abandoned piping and equipment.

   c. If requested by Engineer, remove non-functioning or abandoned piping and equipment, which does not interfere with new work.

   d. Dispose of or store items as requested by Engineer.

B. Maintenance of equipment and systems: Provide maintenance for Plumbing equipment and systems until final acceptance by the Engineer and the Owner, and take such measures as necessary to ensure adequate protection of equipment and material during delivery, storage, installation and shutdown conditions.

1. This responsibility shall include provisions required to meet conditions incidental to delays pending final test of systems and equipment under seasonal conditions.

2. Use of Premises: Use of premises shall be restricted as directed by the Engineer and the Owner and as required below.

3. As required, during progress of work, remove and properly dispose of resultant dirt and debris, and keep premises reasonably clean.

   a. Upon completion of work, remove equipment and unused material provided for work, and 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 Engineer, and as specified in General Conditions.

4. Conduct work so as not to interfere with functioning of existing sewers and water mains.

   a. Extreme care shall be observed to prevent debris from entering piping. Confer with Engineer as to disruption of water service or other utilities due to testing or connection of new work to existing.

C. Superintendence: Keep superintendent or foreman on site during progress of work. Instructions given to such representative by Engineer shall be binding of Contractor.

   1. Do not change representative without prior notification to Engineer.

D. Inspections by Engineer: Undertaking of periodic inspections by Engineer, Engineer, or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of manufacturer of equipment supplied.

E. Surveys and Measurements

   1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.

   2. In event of discrepancy between actual measurements and those indicated, notify Engineer in writing and do not proceed with work until written instructions have been issued by Engineer.

F. Firestopping and proofing:

   1. Coordinate the work of this section with fire stopping provided by others for all new penetrations at fire rated partitions.

   2. Fire stopping for all new penetrations at fire-rated partitions made by this contractor shall be provided by the GC.

   3. Provide a marked plan set for reference by the GC indicating all penetrations that require fire stopping.

   4. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to Owner.

3.2 MATERIALS AND WORKMANSHIP

A. Work shall be executed in workmanlike manner and shall present neat and mechanical appearance when completed.

   1. Piping shall run concealed except in unfinished basement, mechanical rooms and areas where no finished ceiling exists.

   2. Material and equipment shall be installed according to manufacturer's recommended best practice such that completed installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion, or water hammer.

   3. Use of dielectric couplings between dissimilar materials is mandatory. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage prior to completion.

B. Fully insure workmen and work as required by law and General Conditions.

C. Except as otherwise noted, material or equipment mentioned in these Specifications or on Drawings shall be furnished new.

1. Provide supplies, appliances and connections necessary for complete and operational installation.

2. Equipment shall be provided with components required or recommended by OSHA and applicable NFPA documents, and shall be UL approved where applicable.

3. Protection facilities including expanded metal cloth guards over belt drives and couplings shall be provided in conformance with OSHA standards and all other applicable regulations.

D. Notwithstanding any reference in Specifications or on Drawings to material or piece of equipment by name, make or catalog number, such reference shall be interpreted as establishing type, function, and standard of quality desired and shall not be construed as limiting competition.

E. Finish of materials, components and equipment shall not be less than industry good practice.

1. When material or equipment is visible or subject to corrosive or atmospheric conditions, finish shall be as approved by Engineer.

F. Owner shall not be responsible for material and equipment prior to testing and acceptance.

3.3 BULLETINS, MANUALS AND INSTRUCTIONS

A. Obtain at time of purchase of equipment, three copies of operation, replacement and maintenance manuals for all items.

1. Assemble literature in coordinated manuals.

2. In addition to literature listed above manual shall contain the following:

a. Names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.

b. Valve charts

c. Copies of all extended warranties filled out for the owner.

d. Testing reports.

B. Furnish three copies of manuals to Engineer for approval and distribution to Owner.

1. 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 Owner accepts portions of building and equipment for operational use, instruct Owner's operating personnel in any or all parts of various systems.

1. Make adjustments under actual operating condition.

2. Provide a minimum of three separate training sessions.

3.4 CONTINUITY OF SERVICES

A. Do not interrupt water, gas, phone, or electrical services without Owner's approval.

B. Schedule interruptions in advance, according to Owner's instructions. Submit, in writing, with request for interruption, methods proposed to minimize the length of interruption.

C. Interruptions shall be scheduled at such times of the day and work so that they have minimal impact on Owner's operations.

3.5 PIPE HANGERS AND SUPPORTS

A. Hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibrations, and to provide free, guided, expansion and contraction between anchors.

B. Support riser piping independently of connected horizontal piping.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in this section.

E. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

F. Piping shall be supported at no greater than the following intervals:

PIPE MATERIAL/SIZE	HORIZONTAL SPACING	VERTICAL SPACING
Copper (1-1/4" or less)	6'-0"	At each story (10'-0" max)
Copper (1-1/2" or greater)	10'-0"	At each story (10'-0" max)
Cast Iron	5'-0"	At base and each floor (15'-0" max)

G. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation. Galvanized felt isolators sized for copper tubing may also be used.

H. Do not support piping from other pipes, ductwork or other equipment that is not building structure

I. Hangers must be sized for outside diameter of pipe insulation.

3.6 SEISMIC RESTRAINT

A. All seismic restraint systems shall be installed in strict accordance with the manufacturer's guidelines.

B. Transverse piping restraints shall be at 40-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

C. Longitudinal restraints shall be at 80-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

D. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints.

E. Branch lines may not be used to restrain main lines.

F. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors and guides shall be installed as required to provide specified motion capability and limit motion of adjacent piping.

G. Do not brace a system to two independent structures such as ceiling and wall.

H. Provide appropriately sized openings in walls, floors and ceilings for anticipated seismic movement.

3.7 ACCESS AND ACCESS PANELS

A. Perform work required so as to provide proper access to material or equipment, which may need inspection, replacement, repair or service.

1. If proper access cannot be provided, confer with Engineer as to best method of approach to minimize effect of reduced access, which may result.

B. Supply access panels for installation under other Sections where shut-off valves, control valves, check valves, or any items requiring access which are installed under this Section and concealed in floor, wall, furred space or above the ceiling.

1. Access panels shall have same fire rating classification as surface penetrated.

3.8 SLEEVES, PLATES, AND INSERTS

A. Lay out chases, openings and partitions before installation to permit coordinated installation. Coordinate with other trades.

1. Sleeves and inserts shall be set in forms before concrete is poured.

2. Sleeves set in floors or fire walls but not used in final installation shall be filled with concrete or grout flush with floor or wall to ensure proper fire stop.

3. Necessary sleeves in floors or fire walls not provided because of omission or change may be core drilled except where watertight sleeves are required.

B. Provide sleeves for piping between floors and through fire walls or smoke partitions. Provide approved packing between sleeves and piping to provide fire stop.

1. Piping passing through slab on grade shall not require sleeves.

2. Sleeves shall be 12 gauge or heavier steel, first pipe size or larger than outside diameter of pipe to be sleeved.

C. Sleeves through outside walls shall be schedule 40 black steel pipe with 150 pound black steel slip-on welding flanges, welded at center of sleeve, painted with one coat of bitumastic paint inside and outside.

1. Space between sleeve and pipe shall be packed with oakum to within two inches of each wall face.

2. Remaining space shall be packed and made watertight with waterproof mastic.

D. Watertight sleeves through floors shall be schedule 40 black steel pipe, set no less than one inch above finished floor surfaces.

E. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation.

1. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.

F. Sleeves under footings.

1. Sleeves shall be a minimum of 6′-0″ long. Sleeves shall extend 2′-0″ beyond barring area of footing.

3.9 ESCUTCHEONS

A. Escutcheons shall be installed around exposed pipe passing through finished floor, wall, ceiling, or cabinet.

1. Escutcheons shall be heavy cast brass, chromium-plated, unless otherwise noted, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe.

3.10 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas- and water-tight. Jointing shall be types specified for service indicated.

1. Joints and connections shall meet requirements of manufacturers best recommended practice.
2. Provide isolation valves for all fixtures and appliances whether shown on drawings or not
3. All transitions between different piping materials shall be made using approved adapters.
4. Adapters for transitions between two types of piping materials shall be manufactured for purpose intended.

3.11 INTERIOR WATER SUPPLY SYSTEM

A. Water supply piping shall be run as indicated on Drawings, including mains and supplies to indicated equipment.

1. Piping shall be pitched at least 1 inch in 40 feet so that it can be drained completely at low points with drain valves which shall be provided wherever necessary.

B. Shut-off and control valves on main distribution and branch lines shall be located for easy access and operation.

3.12 INTERIOR SANITARY WASTE, AND VENT PIPING

A. Waste, drainage and vent lines shown in building shall be installed as indicated on Drawings; vents shall extend through roof and be increased to 3 inches minimum size.

1. Piping shall be assembled and installed without undue strains and stresses, and provision shall be made for expansion, contraction, and structural settlement.

B. Interior horizontal sanitary waste and storm drainage piping shall be installed in practical alignment at uniform grade of 1/8 inch per foot minimum but 1/4 inch per foot where possible, and as shown on Drawings.

C. Protect piping against breakage when passing under or through wall by means of pipe sleeves.

3.13 TESTING, BALANCING AND ADJUSTING

A. Scope

1. Provide testing, balancing, and adjusting of plumbing systems as shown on Drawings, as specified herein and as required by authorities having jurisdiction, including Owner and Engineer.

a. Perform tests recommended by manufacturers of materials and equipment; this requirement may be waived by Engineer.

2. Testing, balancing and adjusting shall in no way relieve guarantee requirements.
3. Test shall be conducted as part of Work of this Section and shall include labor by qualified personnel, equipment, apparatus and services required to perform tests.
4. Provide letter to engineer stating what system has been tested, a brief description of testing procedure and results of tests.

B. Prior to date of acceptance, furnish Engineer with certificates of testing and inspection for Plumbing systems indicating approval of authorities having jurisdiction and conformance with requirements of Contract Documents.

C. General
1. Submit proposed test procedures, recording forms, and test equipment for review prior to testing.
2. Notify Engineer and authorities involved at least 48 hours prior to testing and inspection.
3. Do not paint, cover or conceal work prior to testing, inspecting and obtaining approval; this includes backfilling and application of insulation.
4. Costs of repairs and restoration of work of other trades and existing building surfaces or material damaged during cleaning or testing shall be borne by trade performing such cleaning or testing.

D. No tests shall be started until systems have been cleaned as described under paragraph "CLEANING".
1. Provide temporary piping and connections for testing, flushing, or draining systems to be tested.
2. Leaks, damage or defects discovered or resulting from tests shall be repaired or replaced to like-new condition.
    a. Leaking pipe joints, fittings, fixtures, etc. shall be removed and replaced with acceptable materials.
3. Piping must be absolutely tight before it will be accepted and joints shall be made tight without caulking.
    a. Tests shall be continued until systems operate without adjustments and repair to equipment or piping.
4. Provide testing instruments, force pumps, gauges, equipment and labor necessary to properly conduct tests.
    a. Instruments used for testing and balancing shall have been calibrated within six months prior to balancing.
    b. Instrument calibration shall be certified.

E. Waste & Vent Piping
1. Final test shall be made after vertical and horizontal pipes and roughing-in have been run and before sewer or fixture connection is made.
2. After soils, wastes, and storm lines, etc. have been installed, outlets shall be temporarily plugged.
3. Fill pipes with water to top of vertical lines and allow to remain so filled for twenty-four hours.
4. Retesting after leaks are repaired shall be at no additional cost.

F. Pressurized Piping Systems

1. Leak tests shall be conducted in accordance with ANSI B31.9 "Building Service Piping" and as specified herein.
2. Before piping of various systems has been covered or furred-in, piping systems shall be tested for 24 hours under hydrostatic pressure 1½ times system working pressures but not greater than 300 psig.
3. Tests shall be witnessed by the Engineer and pronounced satisfactory before pressure is removed or any water drained off.
4. Equipment shall be valved off or removed during test if equipment pressure rating is less than test pressure.
5. Retesting after leaks are repaired shall be done at no additional cost.

3.14 CLEANING

A. Upon completion of work but prior to final system testing, all parts of installation shall be thoroughly cleaned.

1. Fixtures, equipment, pipe, valves, and fittings shall be completely cleaned of grease, metal cuttings, dirt, etc.
2. Protective covers shall be removed and fixtures (including lavatories, water closets, etc.) shall be cleaned and ready for use.

B. Stoppage, discoloration or damage to parts of building, finish or furnishings due to failure to properly clean piping system shall be repaired by trade responsible at no cost to Owner.

END OF SECTION

DIVISION 23

HEATING, VENTILATION, AND AIR CONDITIONING

(HVAC)

SECTION 23.00.01

HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

(Filed Sub-Bid)

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

A. Include the General Conditions of the Contract and Division 1, General Requirements, as part of this Section.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work of this Section with that of all other trades affecting, or affected by, this Section. Cooperate with such trades to assure the steady progress of all work under the contract.

1.2 FILED SUB-BID

A. The HVAC filed sub-bid includes the Work specified in the following Sections.

1. 230000, HVAC
2. 250000, Direct Digital Controls

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority

E. The work of this Section is shown on Drawings M-0.1, M-0.2, MX-1.0, MX-1.1, M-1.0, M-1.1, M-1.2, M-2.1 and M-2.2.

F. Sub-Sub-Bid Requirements:

1. Sub-bidder's attention is directed to Massachusetts GL Chapter 149, Section 44H as amended, which provides in part as follows.
2. Each sub-bidder shall list in Paragraph E of the "Form for Sub-Bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which (the Section of the Specifications for that sub-trade) required such listing; provided that,- in the absence of a contrary provisions in the Specifications, any sub- bidder may, without listing any bid price, list his own name in said Paragraph E for any such class of work or part thereof and perform that work with persons on his own payroll, if such sub-bidder, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work or part thereof with persons on his own payroll and is qualified so to do. This Section requires that the following class(es) of work shall be listed in Paragraph E under the conditions indicated herein.

Classes of Work	Drawing Reference
Insulation	M-0.1, M-0.2, MX-1.0, MX-1.1, M-1.0, M-1.1, M-1.2, M-2.1 and M-2.2.

Sheet Metals

Controls

1.3 SCOPE OF WORK

A. Included in this Section is the furnishing of all labor, materials, equipment and accessories required to provide a complete installation of the work described herein and on the Drawings. Build the work of other trades into the work of this Section as required.

B. Give notices, file plans, obtain permits and licenses, pay fees and backcharges and obtain necessary approvals from authorities having jurisdiction, as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, all of which are part of Contract Documents.

C. The work under this Section consists of:

1. Selective demolition
2. Relocation of ductless minisplit fan coil units including capturing and recycling existing refrigerant. New refrigerant piping and new charge of refrigerant.
3. Fan Coil Units
4. Variable Air Volume Boxes
5. Fan Powered Variable Air Volume Boxes
6. Energy Recovery Ventilator
7. Air Filters
8. Ductwork
9. Registers, Grilles and Diffusers
10. Duct insulation
11. Motorized Dampers
12. Hydronic Baseboard Convectors
13. Piping and Fittings
14. Valves and Unions
15. Piping Accessories
16. Hydronic Specialties
17. Vibration Isolation
18. Thermal Expansion Control
19. Pipe Insulation
20. Pipe Hangers and Supports
21. Sleeves
22. Test and Balance for HVAC systems
23. Access Panels
24. Mechanical Identification
25. Direct Digital Automatic Temperature Controls
26. Provide Close-Out procedures per Division 1.

1.4 ALTERNATES

A. Refer to Division 1 Alternates for work that may affect the work of this Section.

1.5 MECHANICAL SYSTEM NARRATIVE

A. The following narrative describes the Heating Ventilating and Air Conditioning (Mechanical) systems and their function. The intent of this narrative is to comply with the requirements of Section 1301.1.1 of the Massachusetts State Building Code 780 CMR (8th Edition), as amended to adopt the International Energy Conservation Code (IECC 2009), Section 104.2 Information on Construction Documents.

B. Design Intent

1. Heating:

   a. *Building heating is provided by two gas fired hydronic boiler. Renovation and additions will connect to the existing hydronic system. The heating system includes a propylene glycol solution that must be maintained while expanding the system piping.*

2. Ventilating: Outside air for ventilation shall be provided in accordance with the International Mechanical Code (IMC 2009).

   a. *A roof top Energy Recovery Ventilator provides outside air and exhaust. The ERV shall operate in a VAV mode provide Demand Controlled Ventilation (DCV).*

   b. *Classrooms include Demand Controlled Ventilation (DCV) controls that modulate outside air dampers in response to carbon dioxide (CO_2) concentration within each space.*

   c. *An existing roof top Air Handing Unit will supply conditioned outside air to VAV zones.*

3. Cooling:

   a. *New classrooms have no mechanical cooling.*

   b. *An existing roof top Air Handing Unit will provide conditioned air for cooling to VAV zones.*

   c. *Main Office and conference room include existing ductless split systems that will be relocated and reinstalled.*

4. Controls: The building includes a Direct Digital Control (DDC) system on a LonWorks network. A new BACnet DDC system shall be provided for new HVAC equipment installed in this project. Work of this project includes automatic temperature control for all new HVAC components, see Div 25.

C. Basis of Design

1. This project involves renovation of a school located with Climate Zone 5a, (Bedford, Massachusetts).

2. The following Thermal Design Criteria were used to calculate the capacities and parameters for the building as required by Section 302 of the IECC.

   a. *Interior Design Conditions*

      1) *72°F heating*

      2) *76°F cooling*

   b. *Outdoor Design Conditions*

      1) *7°F heating*

      2) *87°F db, 74°F wb cooling*

3. System Intent:

D. Sequence of Operations and Interactions

1. The HVAC systems shall be controlled by a Direct Digital Control (DDC) system. A summary of the sequence of operations and interactions is provided below. Refer to Div 25 for more details.

a. Each heating zone shall be controlled with DDC thermostat or temperature sensor. Motorized two way valves control flow to terminal units in response to desired setpoint.

b. New classrooms shall include Demand Controlled Ventilation (DCV) controls that modulate outside air dampers in response to carbon dioxide (CO_2) concentration within each space.

c. The rooftop Energy Recovery Ventilator (ERV) shall contain variable air volume (VAV) controls that vary fan speed and volume based on differential pressure in response to DCV.

E. Systems and Equipment Capacities

1. Refer to drawings for capacity and performance of equipment.

F. Testing

1. The contractor shall provide complete testing and balancing for all existing systems modified by this project and new systems.

G. Operation Manuals and Maintenance Manuals

1. When the building is completed and ready for occupancy, the contractor shall provide operation manuals and maintenance manuals as required by the contract documents.

H. Record Drawings and Control Documents

1. When the building is completed and ready for occupancy, the contractor shall provide Record Drawings and Test and Balance reports as required by the contract documents.

I. Future Maintenance: Recommended maintenance includes but is not limited to:

1. All maintenance recommended by the various equipment manufacturers.

2. Replacement of air filters.

1.6 RELATED WORK IN OTHER SECTIONS

A. The following work is not included in this Section and will be performed under other Sections:

1. Selective Demolition, Section 024119

2. Electrical, Section 260000

3. Direct Digital Controls 250000

1.7 ITEMS SUPPLIED UNDER OTHER SECTIONS FOR INSTALLATION BY THIS SECTION

A. none

1.8 ITEMS SUPPLIED UNDER THIS SECTION FOR INSTALLATION BY OTHER SECTIONS

A. Access panels

B. Equipment roof curbs

1.9 QUALITY ASSURANCE

A. Perform work in strict accordance with rules, regulations, standards, codes, ordinances, and laws of local, state, and Federal governments, and other authorities having lawful jurisdiction, and be responsible for compliance therewith. Such authorities include but are not limited to the following:

1. Local and state building, plumbing & gas, mechanical, electrical, fire, and health department and public safety codes.

2. International Energy Conservation Code (IECC 2009)

3. The International Mechanical Code (IMC 2009)

4. National Fire Protection Association (NFPA).
5. American Insurance Association (A.I.A.)
6. Occupational Safety and Health Act (OSHA).
7. Factory Mutual Association (FM).
8. Sheet Metal and Air Conditioning National Contractors Association (SMACNA).
9. Material and equipment shall be Underwriter's Laboratory (UL), ASME and AGA approved, as applicable, for intended service.

B. When two or more codes, regulations, etc. conflict with each other or with Contract Documents, the more severe requirement shall govern conduct of work. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction. Approval for such relaxation must be obtained in writing.

C. Most recent editions of applicable specifications and publications of the following organizations form part of the 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. Sheet Metal and Air Conditioning National Contractors Association (SMACNA).
7. National Insulation Manufacturers Association (NIMA).

1.10 SUBMITTALS

A. Submit the following in accordance with Conditions of the Contract and Division-1 Specification Sections.

B. Material and equipment requiring Shop Drawings or Product Data submittal shall include but shall not be limited to:

1. Fan Coil Units
2. Variable Air Volume Boxes
3. Fan Powered Variable Air Volume Boxes
4. Energy Recovery Ventilator
5. Air Filters
6. Ductwork
7. Registers, Grilles and Diffusers
8. Duct insulation
9. Motorized Dampers
10. Hydronic Baseboard Convectors
11. Piping and Fittings
12. Valves and Unions
13. Piping Accessories
14. Hydronic Specialties
15. Vibration Isolation
16. Thermal Expansion Control

17. Pipe Insulation
18. Pipe Hangers and Supports
19. Sleeves
20. Test and Balance for HVAC systems
21. Access Panels
22. Mechanical Identification
23. Direct Digital Automatic Temperature Controls
24. Provide Close-Out procedures per Division 1.

C. Seismic Restraints: Submit shop drawings and calculations detailing seismic hanger restraint requirements to meet state and local codes along with a letter of compliance signed by a registered structural engineer confirming that the piping hangers meet State Seismic Code Requirements.

1. Provide Manufacturer's installation details.
2. Product Manufacturer's product data on strut channels including but not limited to types, finishes, gauge thickness and hole patterns. For each different cross-section submit cross sectional properties including section modulus and moment of inertia.

D. Submit manufacturer's installation instructions, service manuals, parts lists. under applicable provisions.

E. Submit a line item schedule of values for review prior to equipment submittals and for use in the requisition process.

F. Submit blank test and balance report forms.

G. At Substantial Completion prepare a set of as built drawings.

1.11 OPERATION AND MAINTENANCE MANUALS

A. The following paragraphs supplement Division 1.

B. Submit manufacturers' descriptive literature, operating instructions, and maintenance and repair data under applicable provisions.

C. Provide O&M Manual, three copies in three ring binders marked on the cover with the name of the project and the date of final completion. Each binder shall be divided with labeled tab dividers for the following:

1. Contact information for the installing contractor and the 24-hour service provider.
2. Equipment Warranties,
3. Approved submittals,
4. Operations and maintenance manuals parts lists.

1.12 GUARANTEES AND WARRANTIES

A. The provisions under Conditions of the Contract and Division 1 are included.

B. Guarantee work of this Section in writing for one year from date of Substantial Completion.

1. Defects in materials, equipment, workmanship or installation that develop within this period shall be repaired and replaced promptly to the Engineer's satisfaction at no cost to owner.
2. Written guarantee shall stipulate that damage caused in making necessary repairs and replacements shall be corrected at no cost to Owner.
3. The Mechanical systems will be considered substantially complete only after the system has been fully tested and balanced and the engineer has signed off on the completed test and balance forms.

C. Guarantee shall include provision of 24-hour service for complete system during guarantee period at no cost to Owner.

1. Choice of service organization shall be subject to Owner's approval.

D. Submit written guarantee to the Engineer through Contractor before final payment.

E. Transfer individual equipment and material guarantees, which are still in force to Owner at end of guarantee period.

1.13 CONTRACT DOCUMENTS

A. Work to be performed under this Section is shown on the accompanying drawings.

B. Listing of drawings does not limit responsibility of determining full extent of work required by Contract Documents.

1. Refer to other drawings, as well as other specifications sections, which indicate type of construction in which the work must be installed.

2. Locations shown on Drawings shall be checked against general and detailed drawings of the construction proper.

C. Drawings are diagrammatic and indicate general arrangements of systems and work included in Contract.

1. Drawings are not intended to specify or to show every offset, fitting, or component; however, Contract Documents require components and materials, whether or not indicated or specified, as necessary to make installations fully complete and operational.

D. Questions regarding drawings or specifications shall be addressed to the Engineer in writing prior to Award of Contract.

1. Otherwise the Engineer's interpretation of meaning and intent of drawings and specifications shall be final.

1.14 DISCREPANCIES IN DOCUMENTS

A. Where Drawings or Specifications indicate discrepancies or ambiguities, advise the Engineer in writing before Award of Contract.

1. Otherwise, the Engineer's interpretation of documents shall be final; no additional compensation shall be permitted due to discrepancies or ambiguities thus resolved.

B. Where drawings or specifications do not coincide with recommendations of manufacturer of material or piece of equipment, alert the Engineer in writing before installation of item in question.

1. Otherwise, make changes in installation, as the Engineer requires without additional cost to owner.

C. When specifications and drawings are in conflict with each other, or with Contract Documents, the more severe (costly) requirement shall be provided as part of the base bid work.

1. The Engineer may relax this requirement at his sole discretion when such relaxation does not violate ruling of any authority having jurisdiction.

2. Approval for such relaxation must be obtained in writing.

1.15 RECORD DRAWINGS

A. Provide Record and Drawings per Division 1 and requirements below.

B. As work progresses and for duration of Contract, maintain complete and separate sets of prints of Contract Drawings at job site at all times.

1. Record work completed and all changes from original Contract Drawings clearly and accurately. Record valve tags as they are installed.

2. Drawings must be available for review during all engineering site visits.

C. At completion of work, Engineer shall furnish a set of CAD files, AutoCAD Version 2010, of the construction documents, to Contractor. Contractor's professional draftsman shall transfer changes to CAD, AutoCAD Version 2010; submit hard copy drawings and CAD files to the Engineer for review and approval.

D. Upon approval of Record Drawings, print 3 full size sets and 2 half size sets; submit hard copies and CAD files to Engineer.

PART 2: PRODUCTS

2.1 FAN COIL UNITS

A. Furnish and install ducted Fan Coil Units where indicated on the plans and specifications. Units shall be completely factory assembled and tested and shipped as one piece except where noted.

1. All units shall be capable of meeting or exceeding the scheduled capacities for cooling, heating and air delivery. All unit dimensions for each model and size shall be considered maximums.
2. All units shall be designed with coils, fans, motor/drive and drain pan completely contained within the unit cabinet.
3. Hot water coils to be in a blow through configuration when installed in a discharge plenum.
4. Units shall be ETL listed in compliance with UL/ANSI Standard 1995.
5. All unit coils shall meet or exceed the scheduled cooling and heating capacity, selected and rated in accordance with ARI 410.
6. Units shall have published sound power level data tested in accordance with ARI Standard 350-86.

B. All units shall be fabricated of heavy gauge galvanized steel with a minimum G60 zinc coating, able to withstand a 125 hour salt spray test per ASTM B-117. Panels shall be die-formed "multi-bend" construction for optimum strength and rigidity. All exterior panels shall be single wall. Insulation shall be 3/4 inch, 1.8 pound per cubic foot scrim reinforced foil faced insulation, glued and pinned with Mechanical fasteners, and seams are foil taped for maximum positive adhesion. Insulation must comply with UL 181, ASTMC-1071, NFPA 90A & 90B and meets bacteriological standard ASTMC-665 and C-1136 for mold, mildew and humidity resistance. Minimum thermal conductivity shall be 0.24.

1. All units shall have minimum 1" duct collars on discharge and return.
2. The access panel shall be fully insulated and attached with standard lift and turn fasteners on at least two opposite sides. No coil or drain piping or electrical connections shall pass through any access panel.
3. Each unit shall be furnished with a one-piece heavy gauge 304 stainless steel drain pan with welded corner construction.
4. The unit manufacturer shall provide spring type unit mounting vibration isolators.

C. All units shall be furnished with DWDI forward curved centrifugal blowers statically and dynamically balanced for smooth operation. All blower wheels shall have two setscrews and shall be mounted on solid steel shafting rotating in ball bearings with a minimum design average life of 100,000 hours. All blower assemblies shall have resilient mounted cartridge type permanently lubricated ball bearings.

D. All fan motors shall be standard NEMA design motors of the horsepower listed in the equipment schedule. All motors shall be 1750 RPM, 60-hertz (ODP) (ODP E+) single speed motors rated for continuous duty. All motors shall be reversible rotation type. Three phase motors shall be "across-the-line" start type in 56 Frame size up through two horsepower. Three horsepower shall be standard "T" frame with rigid mount.

1. All motors shall be mounted on an adjustable base.
2. All motor wiring is to be terminated in a junction box, external to the unit casing.
3. All fan drive assemblies shall include an adjustable pitch motor pulley, a fixed pitch blower pulley and a standard cross section "V-belt". All fan drives shall be selected at a minimum service factor of 1.2.
4. Provide motor starters and heaters.

E. All unit coils shall be rated in accordance with ARI 410.

1. All coils shall be 1/2" O.D. seamless copper tubes with collared and corrugated aluminum fins. All tubes shall be Mechanically expanded to provide an efficient bond between tube and fin. All water coils shall be provided with a manual air vent fitting to allow for coil venting. Valve core type vent fittings shall not be accepted.
2. All coils shall have 0.0055" thick aluminum fins and 0.016" tube wall thickness.
3. All steam coils shall be suitable for temperatures above 35°F and 15-psig maximum operating pressure.
4. All coils shall be hydrostatically tested with air under water at 450 PSIG minimum pressure and rated for a maximum of 300 PSIG working pressure at 200°F.

F. Each unit shall be furnished with a flat filter rack designed to accept 2" nominal, standard sized, pleated filters. Extra and spare pleated filters shall be provided for each unit per specification.

G. The unit fan motor shall be completely factory wired to an external electrical enclosure. Each unit shall include fan motor operating control with 24-volt control voltage. Each unit shall include motor circuit fusing, control circuit transformer with primary and secondary fusing and terminal strip for connection of field wiring.

H. Provide external galvanized auxiliary drip pan minimum 2" greater than unit footprint on all sides. Provide float switch and wiring to interrupt control circuit.

I. The fan assembly shall be removable and include multi-speed high efficiency motor.

J. Coil shall be 2-pipe configuration meeting the performance shown the drawing schedule.

K. Provide insulated return plenum.

L. Provide air filters including spares.

M. Install duct mounted smoke detectors supplied by the EC for any systems with over 1999 cfm airflow. Provide shut down wiring from the auxiliary contacts on the duct smoke detector to the associated motor controller.

N. Controls and control valves provided by DDC contractor.

O. Coordinate coil hand selection and installation with GC to provide best service access.

P. Fan coil units shall be as manufactured by Enviro-tec, Carrier, Trane, or approved equal.

2.2 VARIABLE AIR VOLUME BOXES

A. Provide VAV boxes as indicated on schedule.

B. Unit shall be certified under ARI Standard 880 and carry ARI seal.

C. Unit casing shall be minimum 22-gauge galvanized steel, internally lined with matte faced insulation which complies with the requirements of NFPA 90A and UL 181.

D. Unit to be Mechanically sealed and gasketed. Air leakage to be less then 2% of nominal CFM at 1.5” sp wg.

E. The primary air valve shall consist of a minimum 22 gauge cylindrical body that includes embossment rings for rigidity. The damper blade shall be connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners.

F. Unit shall have multipoint velocity averaging inlet sensor. For inlet diameters 6" or greater, the differential pressure airflow sensor shall traverse the duct along two perpendicular diameters. Cylindrically shaped inlets shall utilize the equal cross sectional area or log-linear traverse method. Single axis sensor shall not be acceptable for duct diameters 6" or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.3 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.015" w.g. at an air velocity of < 325 FPM. Documentation shall be submitted which substantiates this requirement. Balancing taps and airflow calibration charts shall be provided for field airflow measurements.

G. Unit shall have hydronic reheat coil sized to achieve the performance indicated on the schedule.

1. Coils shall be enclosed in a minimum 20-gauge galvanized steel casing.
2. Coil shall be factory installed on unit.
3. Fins shall be rippled and corrugated heavy gauge aluminum, Mechanically bonded to the tubes.
4. Coil performance shall be tested in accordance with ARI Standard 410.

H. Unit shall be provided with integral sound attenuator and mixing baffles.

1. Unit shall not exceed NC–25 for discharge and NC-28 for radiated noise.
2. All sound data and testing shall be performed in accordance with ARI-880-98.
3. Contractor shall submit sound ratings for each Unit.

I. DDC controls shall be supplied per Div 250000 and installed at the factory.

J. Unit shall be as manufactured by Johnson Controls, or equal by Envirotec or Titus.

2.3 FAN POWERED VARIABLE AIR VOLUME BOXES

A. Provide Fan powered VAV boxes as indicated on schedule. Field-assembled components or built-up terminals employing components from multiple manufacturers are not acceptable

B. Unit shall be certified under ARI Standard 880 and carry ARI seal.

C. Unit casing shall be minimum 22-gauge galvanized steel, internally lined with matte faced insulation which complies with the requirements of NFPA 90A and UL 181.

D. Unit to be Mechanically sealed and gasketed. Air leakage to be less than 2% of nominal CFM at 1.5” sp wg.

E. The primary air valve shall consist of a minimum 22 gauge cylindrical body that includes embossment rings for rigidity. The damper blade shall be connected to a solid shaft by means of an integral molded sleeve which does not require screw or bolt fasteners.

F. Unit shall have multipoint velocity averaging inlet sensor. For inlet diameters 6" or greater, the differential pressure airflow sensor shall traverse the duct along two perpendicular diameters. Cylindrically shaped inlets shall utilize the equal cross sectional area or log-linear traverse method. Single axis sensor shall not be acceptable for duct diameters 6" or larger. A minimum of 12 total pressure sensing points shall be utilized. The total pressure inputs shall be averaged using a pressure chamber located at the center of the sensor. A sensor that delivers the differential pressure signal from one end of the sensor is not acceptable. The sensor shall output an amplified differential pressure signal that is at least 2.3 times the equivalent velocity pressure signal obtained from a conventional pitot tube. The sensor shall develop a differential pressure of 0.015" w.g. at an air velocity of < 325 FPM. Documentation shall be submitted which substantiates this requirement. Balancing taps and airflow calibration charts shall be provided for field airflow measurements.

G. Unit shall contain a supply air fan. Fan include a forward curved, dynamically balanced, galvanized wheel with a direct drive motor.

1. Fan motor shall be ECM™. Motor shall be brushless DC controlled by an integral controller / inverter that operates the wound stator and senses rotor position to electronically commutate the stator. Motor shall be permanent magnet type with near-zero rotor losses designed for synchronous rotation. The motor shall utilize permanently lubricated ball bearings. Motor shall maintain minimum 70% efficiency over the entire operating range.

2. Motor speed control shall be accomplished through a PWM (pulse width modulation) controller specifically designed for compatibility with the ECM™. The speed controller shall have terminals for field verification of fan capacity utilizing a digital volt meter. A calibration graph shall be supplied indicating Fan CFM verses DC Volts.

H. Unit shall have hydronic coil sized to achieve the performance indicated on the schedule.

1. Coils shall be enclosed in a minimum 20-gauge galvanized steel casing.

2. Coil shall be factory installed on unit.

3. Fins shall be rippled and corrugated heavy gauge aluminum, Mechanically bonded to the tubes.

4. Coil performance shall be tested in accordance with ARI Standard 410.

I. Unit shall be provided with integral sound attenuator and mixing baffles.

1. Unit shall not exceed NC–25 for discharge and NC-28 for radiated noise.

2. All sound data and testing shall be performed in accordance with ARI-880-98.

3. Contractor shall submit sound ratings for each Unit.

J. Provide accessory 1" thick air filter.

K. DDC controls shall be supplied per Div 250000 and installed at the factory.

L. Unit shall be as manufactured by Johnson Controls, or equal by Envirotec or Titus.

2.4 ENERGY RECOVERY VENTILATOR

A. Energy Recovery Ventilator shall be listed per ANSI/UL 1995, Heating and Cooling Equipment. Energy transfer ratings shall be ARI Certified. Ventilators shall bear the AMCA Certified Rating Seals for Air Performance. Performance shall be as scheduled on plans. Outdoor air shall not mix with exhaust air in a common plenum. Exhaust discharge and outside air intake shall not be located on the same side on roof top units.

B. Unit Casing and Frames Unit shall be of internal frame type construction of galvanized steel. Frame and panels shall be G90 galvanized steel. All panels exposed to the weather shall be a minimum of 18 gauge galvanized steel. Where top panels are joined there shall be a standing seam to insure positive weather protection. All metal-to-metal seams shall be sealed, requiring no caulking at job site. Permatector exterior finish is available for outdoor units. Unit base to be designed for curb mounting. Unit base shall over hang the curb for a positive seal against water run-off.

C. Weatherhoods: Weatherhoods shall be the same finish as the unit. Outdoor air weatherhood shall incorporate a louvered design and moisture eliminator. Weatherhoods shall be tested in accordance with AMCA Standard 500-L and achieve an ‘A’ water penetration classification rating up to 8 in/hr rainfall at 50 mph.

D. Insulation: Unit casing to be insulated with 1 inch fiberglass with Foil-Scrim-Kraft facing. Insulation shall meet requirements of NFPA 90A and tested to meet UL 181 erosion requirements. Insulation shall be secured to unit with waterproof adhesive and permanent Mechanical fasteners.

E. Dampers: Low Leakage motorized dampers on supply and exhaust inlets.

F. Energy Recovery Wheel: Wheel shall be of the enthalpy type for both sensible and latent heat recovery and be designed to insure laminar flow. Energy transfer ratings must be ARI Certified to Standard 1060 and bear the ARI Certification symbol for ARI Air-to-Air Energy Recovery

Ventilation Equipment Certification Program based on ARI 1060. Ratings "in accordance with 1060" without certification are not acceptable.

1. Desiccant shall be silica gel for maximum latent energy transfer. Wheel shall be constructed of lightweight polymer media to minimize shaft and bearing loads. Polymer media shall be mounted in a stainless steel rotor for corrosion resistance.

2. Wheel design shall consist of removable segments (for wheels greater than 26 inches in diameter) for ease of service and/or cleaning. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat recovery after cleaning. Wheels with sprayed on desiccant coatings are not acceptable. Wheels with desiccant applied after wheel formation are not acceptable. Energy recovery device shall transfer moisture entirely in the vapor phase.

3. Energy recovery drive belt material shall be high strength urethane and shall be factory installed in a pre-stretched state, eliminating the need for field belt tension adjustment. Link style belts are not acceptable.

G. Access Doors: All components shall be easily accessible through removable doors for exhaust, supply, filter, and damper compartments. Energy recovery wheels (smaller than 54 inches) shall be mounted in a slide-out track for ease of inspection, removal, and cleaning.

H. Fan Sections: Centrifugal fans to be double width, double inlet, single fan forward curved type. All blower wheels shall be statically and dynamically balanced.

1. Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds.

2. Separate motors for exhaust and supply blowers shall be provided. Adjustable sheaves on belt-driven fans with motors less than 10 hp shall allow independent balancing of exhaust and supply airflows.

3. Fan and motor assemblies are mounted to unit base with neoprene isolators. Fans shall be located in draw-through position in reference to the energy recovery wheel.

I. Motors and Drives: Motors shall be energy efficient, complying with EPACT standards, for single speed ODP and TE enclosures.

1. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage, phase, and enclosure. Belt-drive motors shall be factory mounted to an adjustable motor plate having two heavy-duty adjusting bolts for alignment and belt tension.

2. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts; 10 horsepower and less shall be supplied with an adjustable drive pulley.

3. Energy wheel motors and direct-drive motors shall have integral overload protection.

J. Variable Frequency Drives:

1. The ERV shall have factory installed VFD's for modulation of the intake and exhaust blower assemblies.

K. Filters: Supply and exhaust air filters shall be 2-inch thick pleated fiberglass, MERV 8 and tested to meet UL Class 2. Filter racks shall be die-formed galvanized steel.

L. Electrical: All internal electrical components shall be factory wired for single point power connection. All electrical components shall be UL Listed, Approved or Classified where applicable and wired in compliance with the National Electrical Code.

M. Units with blowers shall have single-point power connection.

N. Blower motors shall be thermally protected with automatic reset, or supplied with starters.

O. Controls: Provide packaged, independent microprocessor controls that include the following functions:

1. Room temperature sensor
2. Timed exhaust frost control
3. Rotation Sensor
4. Dirty filter sensor
5. Wheel stop economizer
6. Modulating wheel frost control

P. MICROPROCESSOR CONTROLLER:

1. Controller shall be provided with required sensors and programming for rooftop unit. Controller shall be factory programmed, mounted and tested. Controller shall have a LCD readout for changing set points and monitoring unit operation.
2. Controller shall include BMS interface with BACNet protocol.

Q. Install duct mounted smoke detectors supplied by the EC for any systems with over 1999 cfm airflow. Provide shut down wiring from the auxiliary contacts on the duct smoke detector to the associated motor controller.

R. Roof Curbs: Supply roof curb for installation by GC. Roof curb shall include spring vibration isolation with 2" deflection. Curb shall consist of die formed galvanized steel sections. Curb shall be full perimeter type with gasketing provided for field installation between curb and unit base. Curb shall be as manufactured by Novia Associates, or equal.

S. ERV shall be as manufactured by Greenheck, Carrier, or Johnson.

2.5 AIR FILTERS

A. Provide air filters for air handling equipment according the schedule below.

Air Handling Equipment	MERV Rating	Maximum Initial Resistance (in wc)	Remarks
ERV's	8	0.	2"
Fan Coil Units	8	0.	2″
Fan Powered VAV boxes	8	0.	1″

1. Filters shall be rated in accordance with ASHRAE Standard 52.2 Minimum Efficiency Reporting Value (MERV).
2. Filters shall be as manufactured by American Air Filter, 3M or Fiberbond.

B. Replacement schedule:

1. Just prior to occupancy, provide a new set of filters for all air handling equipment
2. In addition to the original filters and the set installed just prior to occupancy, provide two full sets of disposable panel filters as extra for future maintenance purposes. Store at the direction of the Owner's representative.

2.6 DUCTWORK

A. General

1. Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except as otherwise specified or shown on Drawings:

Standard	As Applicable To
SMACNA Duct Construction Standards (SMACNA-DCS)	Metal and flexible ductwork
NFPA 90A	Fire Dampers; Fire Resistance Standard for Ducts and

	Liners
ADC Test Code 106 R4	Ratings of Diffusers, Registers, Grilles

2. Provide supporting and hanging devices necessary to attach entire Mechanical system including ductwork and equipment, and to prevent vibration.

3. Provide vertical and horizontal supports as required by codes to meet minimum earthquake resistance standard for geographical area.

B. General - Sheet Metal Ductwork

1. Ductwork shall be free from vibration under all conditions of operation.

2. Pipe or conduit crossing duct:

   a. No pipe or conduit shall pass through duct without approval of Engineer.

   b. Where it is impossible to re-route pipe or conduit and when written approval has been obtained, increase duct size to maintain constant cross-sectional area at point of interference.

   c. Provide streamlined enclosure for pipe or conduit, as illustrated in SMACNA.

3. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross-sectional area of ductwork shown on Drawings.

4. Ductwork shall have the following pressure-velocity classifications:

Pressure Class	Operating Pressure	Pressure	SMACNA Seal Class	Velocity
2	2 in.	Pos or Neg	C	2500 fpm of less

5. Sealants

   a. Seal duct joints and joints between fittings and ducts with 3M, United Sheet metal or approved equal sealant as required by manufacturer's instructions.

   b. Make and seal duct joints properly. Apply sealant over joint lines and screws. Coverage shall be 1-inch wide on each side of joint. When joint is inaccessible for sealing from outside, cut hand-hole in duct to seal joint form inside. Where possible, sealing shall be on inside of ductwork.

   c. Before assembling fittings and joints, apply sealer to rivets, grooved seams and top-off collars on inside of ductwork. Flood Pittsburgh lock pocket and the zoning plants with sealer.

   d. Brush sealer around washers, corners, notches and top-off collars after assembling ducts.

   e. Coat inside of connecting lap of slip joints and duct surface with sealer.

   f. Do not use tape to seal sheet metal ducts.

6. Provide volume damper, or other approved air balancing device, with indicating and locking quadrant at each branch from main duct, at each duct take-off and at each neck to individual diffuser or register in supply, return or exhaust ducts.

7. Support

   a. Support vertical duct on each floor or slab it penetrates.

   b. Supports for ductwork and equipment shall be galvanized unless specified otherwise.

8. Connections

   a. Provide flexible connections at all mechanical equipment connections. Flexible connections shall be fire retardant fabric, by Vent Fabrics or approved equal.

9. Construction

a. No sharp metal edges shall extend into air streams.

b. Install slip on air-leaving side of duct with sheet metal screws on 6-inch centers.

10. Joints

a. Longitudinal lock seams shall be double-locked and flattened to make tight joints.

b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheet metal screws or bolts and nuts. Do not use rivets and staples.

11. Elbows and Bends

a. Elbows and bends for rectangle ducts shall have centerline radius of 1½ times duct width wherever possible.

b. Where centerline radius is less than 1½ times duct width (on supply and return duct work), supply air elbows shall have single thickness turning vanes. Fasten vanes to runners in installed operating position. Install vanes in accordance with SMACNA DCS.

12. Duct Termination

a. End of duct sections shall be notched and lapped on. Connect ends with bar slips, S-slip and drive caps. Slips shall be made in form of frames, mitered and riveted at corners to prevent leakage.

13. Leakage

a. Test ducts before applying exterior insulation. Correct leaks. Leakage noise shall not be audible from any point in ductwork at distance of 3 feet, as determined by Engineer.

14. Materials

a. Sheet metal ducts shall be constructed of hot-dipped galvanized sheet metal with G90 commercial costing according to ASTM 525 unless specified otherwise.

C. 2" Pressure Class Ductwork - Rectangular

1. Ducts wider than 19 inches with more than 10 square feet of unbraced panel shall be beaded or cross-broken, unless they have nonconductive covering or acoustical liner.

2. Use internal stiffening struts where required and where directed by Engineer.

3. Make changes in duct size with tapered connections as required by SMACNA DCS.

4. Transverse joints shall be made with sip joints; use flat or standing seam according to SMACNA DCS. Where duct size requires standing seam but space restrictions dictate flat seam, flat seam may be used if shown and approved on shop drawings.

D. Low Pressure Ductwork - Spiral Sheet Metal Ductwork

1. Construct per SMACNA. Provide submittal detailing spiral duct manufacturing standards.

E. Low Pressure Ductwork – Round

1. Construct per SMACNA.

2. Seal all joints with liquid sealer.

F. Low Pressure Ductwork - Pre Insulated Flexible Ductwork

1. Flexible ducts shall have an impervious core with wire reinforcement. the inner duct shall be covered with fiberglass insulation with an vapor barrier covering.

2. See insulation specification for requirements.

3. Flex duct shall be UL 181 listed, and shall meet all local codes.

4. Adjustable stainless steel or nylon bands shall be used to connect duct to registers and fittings. a second band shall be installed over the outer jacket, to maintain the vapor barrier.

5. Flexible duct length shall be limited to connections between trunk ducts and diffusers, not to exceed four feet.

6. All flexible ducts shall be fully stretched to reduce resistance.

7. Support the flexible duct with adequate hangers to relieve the strain on any fittings. Unnecessary bends, twists, etc. will not be permitted.

G. Duct Access Doors

1. Provide 1" Insulated Access Doors in Ducts at each automatic or motor-operated Damper, Fire Damper, smoke damper, combination smoke fire damper, at all main trunk duct manual Dampers, and at fresh air, exhaust air and other major manual Dampers and any other location where there is equipment mounted within the ductwork. Access Doors shall be Buckley Model C-10 (Double Cam) or H-10 (Single Cam and Hinge) as manufactured by Buckley Associates.

2. Access Door Panels shall be constructed from 24 Gauge Galvanized Steel (22 gauge on 14 x 14 and larger). Both sides of the Door will have 1/8" Neoprene gaskets to prevent leakage.

3. Access door shall be sized to allow for access and maintenance of equipment within duct.

2.7 REGISTERS, GRILLES, DIFFUSERS, AND AIR TERMINATIONS

A. Registers, Grilles and Diffusers shall be ADC certified.

B. Shall handle air quantities at operating velocities with maximum diffusion within space supplied or exhausted.

C. Shall operate without objectionable air movement as determined by Engineer.

D. Shall operate with sound pressure levels not to exceed NC 25.

E. Return grilles shall be provided for return inlets and shall be sized, at no greater than 400 feet per minute face velocity.

F. Diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface.

G. Provide volume damper on the supply air ductwork to for all diffusers. When ductwork is made inaccessible by a hard ceiling provide opposed blade volume damper operable through the face of the diffuser.

H. Registers, Grilles and Diffusers shall be as manufactured by Titus, Price or Hart & Cooley.

2.8 DUCT INSULATION

A. Duct liner: Provide duct liner, for both supply and return rectangular ducting connected to air handlers and ducted fan coil units.

1. Duct liner shall be flexible glass fiber; ANSI/ASTM c553, class 1; 'k' value of 0.24 at 75 degrees f; 24 lb/cu.ft. minimum density; coated air side for maximum 4,000 ft/min. air velocity.

2. Use one-inch thick insulation.

3. Secure duct liner with Mechanical fasteners on 15-inch centers on top and side of ductwork with any dimension exceeding 20 inches. Seal and smooth joints do not use nail type fasteners.

4. Ductwork dimensions indicated are net inside dimensions required for airflow. Increase outside ductwork dimensions as required allowing for insulation thickness.

5. Materials and installation shall meet following standards, as applicable:

a. NFPA-90A

b. Fire hazard classifications of 25-flame spread, 50 smoke developed, and 50 fuel contributed according to ASTM E-84, NFPA 255, UL 723 Class I.

B. Exterior duct insulation: Insulate the exterior of all concealed supply duct work that is not lined, duct that runs in unconditioned space, attics, and outside air intake ducts.

1. Duct Insulation: Flexible glass fiber; ANSI/ASTM C553, Class 1; 'K' value of 0.30 per inch at 75 degrees F; covered with foil faced vapor barrier.

2. Use thickness to achieve a minimum of R-3 in conditioned spaces.

3. Use thickness to achieve a minimum of R-12 where ductwork is outside of the building.

4. Secure duct insulation with manufacturers tapes and methods. Assure continuous vapor barrier.

5. Materials and installation shall meet following standards, as applicable:

a. NFPA-90A

b. Fire hazard classifications of 25-flame spread, 50 smoke developed, and 50 fuel contributed according to ASTM E-84, NFPA 255, UL 723 Class I.

2.9 AIR DAMPERS

A. Dampers shall be opposed blade, gasketed, suitable for motorized operation.

B. Dampers which provide an air barrier to separate the outside air from the building interior or interior air systems shall have a leakage no greater than 3 cfm/ft^2 at 1.0" w.g. when tested in accordance with AMCA 500. Dampers which provide an air barrier to separate the outside air from the building interior or interior air systems shall have a leakage no greater than 3 cfm/ft^2 at 1.0" w.g. when tested in accordance with AMCA 500.

C. Coordinate damper dimensions with louver and ductwork.

D. Unit shall be as manufactured by Buckley, Greenheck, or Honeywell.

2.10 DAMPER MOTORS

A. Provide damper motors (actuators) for all new dampers installed in this project.

B. Open/closed spring return damper actuators shall be direct-coupled type which require no crank arm and linkage and be capable of direct-mounting to the damper jack shaft.

C. Actuators shall be capable of clockwise or counterclockwise fail-safe operation.

D. Actuators shall be protected from overload at all angles of rotation.

E. Actuators shall be UL listed and CSA certified.

F. Actuators shall be as manufactured by Belimo, Honeywell, or Johnson Controls.

2.11 HYDRONIC BASEBOARD CONVECTORS

A. High output hydronic baseboard convector shall be furnished and installed in the locations shown on the applicable drawings. Specified length is active finned element. (Enclosure length will be longer then specified finned tube length.) Provide enclosure length as required to conceal specified active finned element and respective valves and piping. If substitution is made from specified baseboard then contractor is responsible for confirming baseboard output matches specified output.

B. Baseboard convector enclosures shall be manufactured of optional 16-gauge steel front cover, and 20-gauge steel back panel.

C. Convector element shall include copper tubes mechanically bonded to aluminum fins.

D. Copper tube shall be 1” Type M.

E. Aluminum fin density shall be 40 fins per foot.

F. Construction shall include:

1. Full back panel with interlocking slope top front panel.

2. Bracket with element guide spot welded to back panel every 24 inches alternating with cabinet spacer welded to back panel every 24 inches giving rigid support to front every 12 inches.

3. For fastening front of enclosure to support brackets, use #8 x 3/8" self-tapping screws with countersunk head. Provide touch-up painting to match enclosure color.

G. All baseboard enclosure, access panels, end caps and splice plates shall have a powder coat baked enamel finish. Color to be selected by Owner.

H. Convectors shall be Model HD-1400 with H-4 element as manufactured by Slant-Fin, equivalent unit by Rittling, Sterling, or approved equal.

2.12 PIPING AND FITTINGS

A. Unless otherwise noted, all piping fittings, including nipples, shall be new material absolutely perfect throughout, scale free, and of the best grade guaranteed full weight. All steel pipe shall be as manufactured by National Tube Co., Youngstown Sheet & Tube Co., Bethlehem Steel Co.. Copper tubing shall be as manufactured by Bridgeport Brass, American Brass, Revere Copper and Brass. The manufacturer's name or brand shall be rolled or stamped on each length of pipe and nipple. All piping shall conform to American Standards Association "Code for Pressure Piping"

B. All nipples and fittings shall be of the same material and thickness as the pipe which they are used, except as otherwise noted and/or where screwed fitting are used on steel pipe, in which case they shall have band and clean cut, full taper thread. Welding fittings shall be standard weight, conforming to ASA B36.10. Welding elbows shall be long radius patter, unless otherwise specifically authorized for each location.

C. Schedule of Pipe Fitting Materials

SERVICE	MATERIAL	JOINTS	FITTINGS
Hydronic	Steel Schedule 40	Up to 2 inch: Screwed; Larger than 2 inch: Welded*	Malleable Iron/Steel Schedule 40
Hydronic	Copper Type - L	Copper Soldered **	Wrought Copper
Refrigerant	Copper, Refrigerant	Copper Brazed	Wrought Copper

* Victaulic grooved piping system is acceptable.

** Viega Pro-Press is acceptable.

** PEX piping may be accepted as an alternative for limited portions of the hydronic system when approved by the engineer.

2.13 VALVES AND UNIONS

A. Isolation Valves:

1. Up to 2-1/2 Inches:

a. Provide bronze two-piece, ¼ turn, full port ball valve with chrome-plated brass ball, blowout proof stem and lever handle.

b. Provide extended valve stems where insulation thickness is greater than 1" or where handle movement is impeded by insulation."

c. Valve shall have PTFE seats and stem packing seal.

d. Rated for 600 PSIG WOG service.

e. As manufactured by Apollo, Watts, or Jenkins.

2. Larger than 2-1/2 inches:, provide ball or butterfly valve: Butterfly valves shall be iron body, cast iron nickel plated disc, resilient EPDM replaceable seat for service to 250 degrees F, wafer or lug ends, extended neck, infinite position lever handle with memory stop.

3. Install ball or butterfly valves for all shut-off, bypass and to isolate equipment, part of systems, or vertical risers.

4. Provide extended valve stems where pipe insulation is greater than 1” thick.

B. Check valves:

1. Up to 2 in. and smaller shall be bronze, screwed ends, spring type.

2. 2-1/2 in. and larger shall be iron body, flanged ends, bronze mounted, spring type.

C. Balancing Valves

1. Circuit balancing valves to have two ¼" NPT brass metering ports with Nordel check valves and gasketed caps located on both sides of valve seat.

2. Two additional ¼" NPT connections with brass plugs are to be provided on the opposite side of the metering ports for use as drain connections.

3. Drain connections and metering ports are to be interchangeable to allow for measurement flexibility when the valves are installed in tight locations.

4. Valves are to be "Y" pattern, modified, equal percentage globe style and provide three functions:

a. Precise flow measurement

b. Precision flow balancing

c. Positive drip tight shut-off

5. Valve shall provide multi-turn, 360-degree adjustment with a micrometer type indicator located on the valve hand-wheel.

6. Valve hand-wheel shall have hidden memory feature to provide a means for locking the valve position after the system is balanced.

7. Ninety-degree turn adjustable valves are not acceptable.

8. Valve body shall be bronze with ultra high strength engineered resin plug.

9. Plug shall have precision-contoured channels to distribute flow uniformly across valve seat.

10. Valve stem shall be bronze; hand-wheel and sleeve shall be high strength resin.

11. Valves shall have a minimum of four complete 360-degree hand-wheel turns.

12. Balancing valves to be Armstrong or approved equal.

D. Unions:

1. 2 inch and smaller shall be ground joint type, all brass body, with bronze seat.

2. Larger than 2”, unions shall be brass flanged type with steel bolts and nuts, and full faced gasket.

2.14 HYDRONIC SPECIALTIES

A. Air Vents

1. The top of main forced hot water supply and return risers shall be provided with an automatic air vent.

2. Air vents shall be "Spirotop" automatic air vent as manufactured by Spirotherm, Inc. or approved equal.

3. Float Type: Brass or semi-steel body, copper or plastic float, stainless steel valve and valve seat; unit shall allow manual disassembly for repair or float replacement; suitable for system operating temperature and pressure; with isolating valve.

4. Provide isolation valve for each vent to allow work on the vent without requiring system drainage.

B. Relief Valves

1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

C. Dielectric Connections:

1. Connections shall be of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

2. Insulating material shall be suitable for system fluid, pressure, and temperature.

3. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig minimum working pressure at 180 deg F.

4. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150-psig minimum working pressure as required to suit system pressures.

5. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

a. Separate companion flanges and steel bolts and nuts shall have 150-psig minimum working pressure where required to suit system pressures.

6. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

7. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

8. All piping connections between dissimilar materials shall use dielectric connection where materials are joined.

2.15 STRAINERS

A. Provide strainers to capture particulates within the hydronic system.

B. Strainer shall have a two piece brass body with EPDM seals and internal mesh screen.

C. Top of body shall include a tapping for an optional air vent.

D. Bottom of body shall include a ball valve drain with hose connection.

E. Select strainer for no greater than a maximum velocity of 4 feet per second.

F. Strainers shall be Dirtcal as manufactured by Caleffi, or Spirotherm or MEPCO.

2.16 PIPING ACCESSORIES

A. The Contractor is expected to furnish and install all accessories, valves, fittings, specialties, and similar items commonly used for installations of this type. This includes, but is not necessarily limited to shut-off valves to isolate components for repair or replacement, safety controls usually associated with these system types, connection to controls as required, and any other items that the contractor deems suitable or desirable for the installation.

2.17 PIPE INSULATION

A. All pipes, valves, fittings, flanges, and similar elements conveying, refrigerant, condensate, forced hot water, and cold city water, shall be insulated as follows:

1. Provide material and thickness as indicated in the table below.

Pipe insulation minimum thickness (inches)					
	Insulation conductivity		Nominal pipe size		
fluid	Conductivity btu*in/(h*ft^2 * °F)	mean temp rating	< 1"	1" to 1½"	1½"<
Hydronic heating Water	0.27	75°F	1.50	1.50	2.0
Refrigerant	0.27	75°F	1.50	1.50	1.50

B. Pipe supports shall be external to the insulation.

C. Insulation, jackets and adhesives shall be flame retardant. Fire and smoke Hazard ratings to be as tested under procedure ASTM E-84, NFPA 255 and UL 723, not exceeding:

Flame Spread	25
Smoke Developed	50

D. Fiberglass insulation shall be: Fibrous glass insulation with factory-applied fire retardant vapor barrier jacket with K factor as indicated in the table above; by Owens-Corning, Certain-Teed, or Manville.

E. Foam insulation shall be: Flexible elastomeric expanded closed-cell, thermal insulation, supplied as unslit tubing. Thermal Conductivity: 0.27 Btu in/h°F by Armacell, Armaflex, or K-Flex Insultube.

1. For DX heat pump systems: Provide continuous insulation for both liquid and vapor refrigerant lines.
2. For DX air conditioning only systems: Provide continuous insulation for vapor refrigerant lines.
3. For foam insulation exposed to sunlight: coat with compatible exterior paint-on coating to prevent degradation by UV light. Provide separate submittal for this product.

F. Provide continuous vapor barrier for all piping.

G. Insulation shall be installed by insulation firm regularly specializing in this work and employing men particularly skilled therein. No covering applied by plumber's helpers will be acceptable.

H. Install materials after piping has been tested and approved.

I. Continue installation with vapor barrier through penetrations.

J. Insulation and vapor barrier on piping which passes through walls or partitions shall pass continuously through sleeve, except that piping between floors and through fire walls or smoke partitions shall have space allowed for application of approved packing between sleeves and piping, to provide fire-stop as required by NFPA. Seal ends to provide continuous vapor barrier where insulation is interrupted. Apply performed jacketed insulation to valves, fittings and pump and equipment flanges.

K. Use glues and tapes that are from the same manufacturer as the insulation itself. Install per manufacturers recommendations. Provide separate submittal for these products.

2.18 PIPE HANGERS AND SUPPORTS

A. Uninsulated pipes 2 inch and smaller:

1. Adjustable steel swivel ring (band type) hanger.
2. Adjustable steel swivel J-hanger.
3. Malleable iron ring hanger or hinged ring hanger.
4. Malleable iron split-ring hanger with eye socket.

5. Adjustable steel clevis hanger. (MSS Type 1)

B. Uninsulated pipes 2-1/2 inch and larger:

1. Adjustable steel clevis hanger.
2. Pipe roll with sockets.
3. Adjustable steel yoke pipe roll.

C. Insulated pipe- Hot water piping:

1. 2 inch and smaller pipes:
   a. *Adjustable steel clevis with galvanized sheet metal shield.*
2. 2-1/2 inch and larger pipes:
   a. *Adjustable steel yoke pipe roll with pipe covering protection saddle.*
   b. *Pipe roll with sockets with pipe covering protection saddle.*

D. Insulated pipe- Cold water piping:

1. 5 inch and smaller pipes:
   a. *Adjustable steel clevis with galvanized sheet metal shield.*

E. PEX tubing (cross linked Polyethylene)

1. Use only plastic tubing supports.
2. Select supports with respect to service temperature of tubing to ensure maximum continuous working temperature of support is not exceeded.
3. Provide suspension clips or approved plastic insulator at penetrations through studs/joists and where abrasion is a concern. Provide nailing plates to protect tubing concealed within the wall.
4. Support horizontal PEX every 32” with U-clips or suspension clips.
5. Support vertical PEX every 48” and at each floor using J-Clamp or lock clip style fasteners.
6. Provide ear drop bend support where PEX turns sharply to exit a wall (e.g. for connection to a radiator).
7. Supports shall be as manufactured by Viega, Sioux Chief, or Uponor.

F. Pipe Clamps

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts. For insulated lines use double bolted pipe clamps.

G. Multiple or Trapeze Hanger

1. Trapeze hangers shall be constructed from 12 gauge roll formed ASTM A1011 SS Grade 33 structural steel channel, 1-5/8□inch by 1-5/8□inch minimum or stronger as required.
2. Mount pipes to trapeze with 2 piece pipe straps sized for outside diameter of pipe.

H. For pipes subjected to axial movement:

1. Strut mounted roller support. Use pipe protection shield or saddles on insulated lines.
2. Strut mounted pipe guide.

I. Wall Supports

1. Pipes 4 inch and smaller:
   a. *Carbon steel hook.*
   b. *Carbon steel J-hanger.*
2. Pipes larger than 4 inch:

a. Welded strut bracket and pipe straps.

b. Welded steel brackets, with roller chair or adjustable steel yoke pipe roll. Use pipe protection shield or saddles on insulated lines.

J. Floor Supports

1. Hot piping under 6 inch and all cold piping:

a. Carbon steel adjustable pipe saddle and nipple attached to steel base stand sized for pipe elevation. Pipe saddle shall be screwed or welded to appropriate base stand.

2. Hot piping 6 inch and larger:

a. Roller stand with base plate

b. Adjustable roller support and steel support sized for elevation.

K. Vertical Supports

1. Steel riser clamp sized to fit outside diameter of pipe.

L. Copper Tubing Supports

1. Hangers shall be sized to fit copper tubing outside diameters.

2. Adjustable steel swivel ring (band type) hanger.

3. Malleable iron ring hanger or hinged ring hanger.

4. Malleable iron split-ring hanger with eye socket.

5. Adjustable steel clevis hanger.

6. For supporting vertical runs use epoxy painted or plastic coated riser clamps,.

7. For supporting copper tube to strut use epoxy painted pipe straps sized for copper tubing or plastic inserted vibration isolation clamps.

M. Insulation Shields:

1. Shield for Insulated Piping 2 Inches and Smaller: 18 gage galvanized steel shield over insulation to cover the lower 180 degree of pipe, minimum 12 inches long centered on pipe support.

2. Shields for Insulated Piping 2-1/2" and larger: 16 gage galvanized steel shield over insulation to cover the lower 180 degree of pipe, minimum 12 inches long centered on pipe support.

N. Pipe Protection Saddles

1. Pipe protection saddles shall be formed from carbon steel, 1/8 inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

O. Hanger Finishes

1. Indoor Finishes

a. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint. Additional PVC coating of the epoxy painted hanger shall be used where necessary.

b. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633.

c. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 or have an electro-deposited green epoxy finish.

2. Outdoor and Corrosive Area Finishes

a. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized or stainless steel. Zinc plated hardware is not acceptable for outdoor use.

2.19 SEISMIC RESTRAINT

A. All Pipe hangers and equipment supports shall be constructed in accordance with Seismic Zone requirements as outlined in the Massachusetts State Building Code.

B. The contractor shall provide pre-engineered seismic restraint systems to meet total design lateral force requirements for support and restraint of piping systems where required. This contractor shall submit shop drawings and calculations detailing the requirements to meet state and local codes along with a letter of compliance signed by a registered structural engineer confirming that the piping hangers meet State Seismic Code Requirements.

C. Seismic Bracing and Support Systems:

1. Design analysis shall include calculated dead loads, static seismic loads and capacity of materials utilized for the connection of the equipment or system to the structure.

2. Analysis shall detail anchoring methods, bolt diameter and embedment depth.

3. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code.

4. Friction from gravity loads shall not be considered resistance to seismic forces.

D. Cables provided for seismic shall be color coated and prestressed.

2.20 VIBRATION ISOLATION

A. For each element of rotating Mechanical equipment, provide vibration isolation to reduce the transmission of vibration from the equipment to the supporting building member.

B. Provide ribbed neoprene and cork pads for mounting of floor mounted air handling and fan coil units.

C. Provide spring and neoprene hangers for horizontal air handlers, fan coils, exhaust fans, and/or supply fans.

D. Provide spring and neoprene hangers for isolating the piping in the boiler room from any attachment to the ceiling. Rack pipes and suspend racks with isolation hangers.

E. Vibration isolation shall be as manufactured by Mason Industries, VibraSystems, or Acoustical Solutions.

2.21 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel.

B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

C. Provide copper plated hangers and supports for copper piping.

2.22 MECHANICAL IDENTIFICATION

A. Provide identification of all new Mechanical systems. Colors per ANSI/ASME A13.1 unless otherwise specified.

B. Equipment

1. Identify fan coil units, energy recovery ventilators, vav boxes, with embossed phenolic plates.

2. Identify all motor starters per equipment schedule with embossed phenolic nameplate secured to the front face of the starter.

C. Controls: Identify control panels and major control components outside panels with embossed phenolic nameplates.

D. Piping: Identify piping with plastic tape markers. Identify service, and flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and tee, at each side of penetration of structure or enclosure and at each obstruction.

E. Valves: Identify valves motorized valves, and isolation valve in main and branch piping with embossed brass tags.

F. Provide valve chart and schedule for inclusion in three ring project manual.

2.23 TEMPERATURE GAUGES

A. Provide thermometers as indicated on the applicable drawings.

B. Thermometers shall have digital readout, solar powered.

C. Case shall be high-impact ABS.

D. Range: -40 to +300 degrees F.

E. Display shall be 3/8" high LCD.

F. Resolution: 0.1 degree F.

G. Display shall be visible when photocell assembly is subjected to one foot-candle of light.

H. Thermometers shall be Digital Vari-angle as manufactured by Weiss, equivalent unit by Taylor, B&K, or approved equal.

2.24 PRESSURE GAUGES

A. Dial-type pressure gauges shall be provided as indicated on the applicable drawings.

B. Face diameter shall be 4" nominal.

C. Internal components shall be bronze.

D. Accuracy shall be two percent of full scale, maximum.

E. Gauges shall be filled with glycerin (or similar viscous fluid).

F. Scale shall be such that normal operating pressure is (approximately) mid-scale on the gauge.

G. Gauges shall be provided with a bottom fitting and installed with a ¼" isolation ball valve.

H. Gauges shall be LF series by Weiss, equivalent unit by Taylor, Valley Instruments, or approved equal.

I. Pressure Gauges:

1. Provide pressure gauges for supply and return at each duplex pump installation and as shown on drawings.
2. Gauges to have 2½-inch diameter face, glycerin filled.
3. All gauges to be provided with gauge cock for positive shut-off.
4. Scale selection to be such that the normal operating pressure of the measured medium is near the mid-point of the scale.
5. Gauges shall be as manufactured by Ametek, or equivalent unit by Ashcroft, or Taylor.

J. Provide pressure test ports for all circulation pumps within close proximity to the pump flanges. Test ports to allow pressure and temperature testing while the system is under pressure and operational.

2.25 AUTOMATIC TEMPERATURE CONTROLS

A. Provide full direct digital controls system to properly operate and control all elements of the new HVAC systems, See Division 25 for requirements. This HVAC contractor shall be responsible for all control work.

B. Devices to be controlled shall include but not be limited to fan coil units (FCU's), VAV boxes, ERV, and baseboard radiation.

C. Provide control devices to achieve the sequence of operations as outlined in Division 25. Control components shall include but not be limited to control valves, aquastats, temperature sensors thermostats, motorized dampers, damper motors, automatic relays, starters, sensors, interface equipment, low temperature detection thermostats, and other apparatus required to operate HVAC systems and to perform functions specified.

D. Supply and install all materials necessary to connect control components factory supplied as part of equipment controlled, unless specified otherwise.

E. Provide shop drawings and product data submittals indicating controls and their schematic layout. Include sequences of operation, wiring diagrams, etc.

F. Wiring (General): All line voltage automatic temperature control wiring shall be run in EMT (above 30 VAC). All low voltage control wiring shall be run in EMT in Mechanical rooms and run using independently supported plenum rated cable in areas above dropped ceilings or other concealed locations where damage to the wiring will not occur. Conduit is required wherever wiring would be exposed to public view.

2.26 ACCESS PANELS

A. Provide access panels where required to access all concealed valves and system adjustment elements.

B. Provide panels that match the fire rating of the assembly into which they are to be installed.

C. Access panels shall be by Knapp, Milcor, or Way Loctor,; coordinate final selection with other trades supplying similar access panels.

D. The contractor shall determine the quantity and size of access panels. Access panels shall be sized and located to allow servicing, repair, and replacement.

E. Frame shall be 16-gauge steel.

F. Doors shall be 14-gauge steel, opened by a screwdriver-operated stainless steel cam latch.

G. Factory finish shall be gray primer.

H. Access panels shall be flush type.

2.27 SPARE PARTS

A. Spare parts shall be identical with respect to the manufacturer, model and function as the equipment that is installed.

2.28 PROPYLENE GLYCOL

A. Provide propylene glycol antifreeze solution for heating system.

B. Provide 40 percent solution of NOBLE NOBURST containing DOWFROST brand propylene glycol or approved equal.

C. Specific Heat Capacity at 160 degrees F shall be 0.937 cal./g/degree C. at 50 percent solution. ***Or (Propylene glycol for high efficiency cast aluminum boilers.)*** Provide propylene glycol anti-freeze solution for the hydronic heating system specifically formulated for combustion devices using aluminum waterways.

D. Solution shall include propylene glycol, corrosion inhibitor, viscosity reducing agent, orange dye, deionized water and defoaming agent.

E. Solution shall not contain silicates.

F. Specific heat capacity at 160°F. shall be 0.939 btu/lb °F at 50% concentration.

PART 3: EXECUTION

3.1 SPECIAL RESPONSIBILITIES

A. Coordination: Cooperate and coordinate with other trades in executing work of this section as described hereunder.

1. Perform work so that progress of entire project including work of other trades whether involved in work of this or other Sections shall not be interfered with or delayed.

2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.

3. Obtain detailed information from manufacturers of equipment to be provided under this Section as to proper methods of installation.

4. Obtain final roughing dimensions or other information as needed for complete installation of all items furnished under other Sections or by Owner.

5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections.

   a. Give full information so that openings required by work of this Section may be coordinated with other work and other openings may be provided for in advance.

   b. In case of failure to provide necessary and sufficient information in proper time, trade involved will be required to do cutting and patching or have same done, at own expense and to full satisfaction of Engineer.

6. Notify Engineer of location and extent of piping, ductwork and equipment of other trades which interferes with the work of this section.

   a. In coordination with and with approval of Engineer, relocate such piping, wiring and equipment to permit new work to be provided as required by Contract Documents.

B. Maintenance of equipment and systems: Provide maintenance for Mechanical equipment and systems until final acceptance by Engineer and Owner, and take such measures as necessary to ensure adequate protection of equipment and material during delivery, storage, installation and shutdown conditions.

1. This responsibility shall include provisions required to meet conditions incidental to delays pending final test of systems and equipment under seasonal conditions.

C. Use of Premises: Use of premises shall be restricted as directed in Division 1 and as required below.

1. As required, during progress of work, remove and properly dispose of resultant dirt and debris, and keep premises reasonably clean.

   a. Upon completion of work, remove equipment and unused material provided for work, and 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 Engineer, and as specified under paragraph "CLEANING."

2. Conduct work so as not to interfere with functioning of existing sewers and water and gas mains.

   a. Extreme care shall be observed to prevent debris from entering piping. Confer with Engineer as to disruption of water service or other utilities due to testing or connection of new work to existing.

D. Superintendence: Keep superintendent or foreman on site during progress of work. Instructions given to such representative by Engineer shall be binding of Contractor.

1. Do not change representative without prior notification to Engineer.

E. Inspections by Engineer: Undertaking of periodic inspections by Engineer or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of manufacturer of equipment supplied.

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 Engineer in writing and do not proceed with work until Engineer has issued written instructions.

G. Firestopping and fireproofing:

1. Coordinate the work of this section with fire stopping provided by others for all penetrations at fire rated partitions.

2. The GC shall provide fire stopping for all new penetrations at fire-rated partitions made by this contractor.

3. Provide a marked plan set for reference by the GC indicating all penetrations that require fire stopping.

4. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to Owner.

3.2 PIPE HANGERS AND SUPPORTS

A. Hangers shall be arranged to maintain the required grading and pitch of piping, to prevent vibrations, and to provide free, guided, expansion and contraction between anchors.

B. Support riser piping independently of connected horizontal piping.

C. Place a hanger within 12 inches of each horizontal elbow.

D. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in this section.

E. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

F. Horizontal piping shall be supported in accordance with MSS SP-69 and as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
½ to 1-1/4 inch	6'-0"	3/8"
1-1/2 to 2 inch	10'-0"	3/8"
2-1/2 to 3 inch	10'-0"	1/2"
4 to 6 inch	10'-0"	5/8"
8 to 12 inch	14'-0"	7/8"

G. Support vertical piping at each floor but no more than ten-foot intervals.

H. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non adhesive isolation. Galvanized felt isolators sized for copper tubing may also be used.

I. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

3.3 SEISMIC RESTRAINT

A. All seismic restraint systems shall be installed in strict accordance with the manufacturer's guidelines.

B. Transverse piping restraints shall be at 40-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

C. Longitudinal restraints shall be at 80-foot maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.

D. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints.

E. Branch lines may not be used to restrain main lines.

F. Piping crossing building seismic or expansion joints, passing from building to building, or supported from different portions of the building shall be installed to allow differential support displacements without damaging the pipe, equipment connections, or support connections. Pipe offsets, loops, anchors and guides shall be installed as required to provide specified motion capability and limit motion of adjacent piping.

G. Do not brace a system to two independent structures such as ceiling and wall.

H. Provide appropriately sized openings in walls, floors and ceilings for anticipated seismic movement.

3.4 MATERIALS AND WORKMANSHIP

A. Work shall be executed in workmanlike manner and shall present neat and Mechanical appearance when completed.

1. Ductwork and piping shall run concealed except in Mechanical rooms and areas where no hung ceiling exists unless otherwise shown on drawings.

2. Material and equipment shall be installed according to manufacturer's recommended best practice such that completed installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion, or water hammer.

3. Use of dielectric couplings between dissimilar materials is mandatory. Work shall be properly and effectively protected, and pipe openings shall be temporarily closed to prevent obstruction and damage prior to completion.

B. Fully insure workmen and work as required.

C. Except as otherwise noted, material or equipment mentioned in these Specifications or on Drawings shall be furnished new.

1. Provide supplies, appliances and connections necessary for complete and operational installation.

2. Equipment shall be provided with components required or recommended by OSHA and applicable NFPA documents, and shall be UL approved where applicable.

3. Protection facilities including expanded metal guards over belt drives and couplings shall be provided in conformance with OSHA standards and all other applicable regulations.

D. Notwithstanding any reference in Specifications or on Drawings to material or piece of equipment by name, make or catalog number, such reference shall be interpreted as establishing type, function, and standard of quality desired and shall not be construed as limiting competition.

E. Finish of materials, components and equipment shall not be less than industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, finish shall be as approved by Engineer.

F. Owner shall not be responsible for material and equipment prior to testing and acceptance.

3.5 BULLETINS, MANUALS AND INSTRUCTIONS

A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items.

1. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as-built wiring diagrams.

2. Manual shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.

B. Furnish three copies of manuals to Engineer for approval and distribution to Owner.

1. 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 Owner accepts portions of building and equipment for operational use, instruct Owner's operating personnel in any or all parts of various systems.

1. Such instructions shall cover period of control such as will take Mechanical equipment through complete cycle.

2. Make adjustments under actual operating condition. Provide a minimum of three separate training sessions, each of up to one days duration.

3.6 CONTINUITY OF SERVICES

A. Do not interrupt existing or temporary services without Owner's approval and coordination with the GC.

B. Schedule interruptions in advance, according to Owner's instructions. Submit, in writing, with request for interruption, methods proposed to minimize the length of interruption.

C. Interruptions shall be scheduled at such times of the day and work so that they have minimal impact on Owner's operations.

3.7 ACCESS AND ACCESS PANELS

A. Perform work required so as to provide proper access to material or equipment, which may need inspection, replacement, repair or service.

1. If proper access cannot be provided, confer with Engineer as to best method of approach to minimize effect of reduced access, which may result.

B. Supply access panels for installation under other Sections where shut-off valves, control valves, check valves, or any items requiring access which are installed under this Section and concealed in floor, wall, furred space or above the ceiling.

C. Ceiling consisting of lay-in or removable splined tiles do not require access panels.

1. Valves above the ceiling shall have locations marked with thumb tacks on finished ceiling panels; locations shall be noted on record drawings.

D. Access panels shall have same fire rating classification as surface penetrated.

3.8 SLEEVES, PLATES, AND INSERTS

A. Lay out chases, openings and partitions before installation to permit provision in work. Sleeves and inserts shall be set in forms before concrete is poured.

1. Extra work required where sleeves, chase openings or inserts have been omitted or improperly placed shall be performed at expense of trade which made error or omission.

B. Sleeves provided for piping between floors and through fire walls or smoke partitions shall be installed with approved packing between sleeves and piping to provide for fire stop.

C. Pipe passing through floors, walls and partitions shall be provided with 12 US Ga galvanized iron sleeve, first pipe size larger than outside diameter of insulation to be sleeved.

D. Sleeves installed in floors shall extend two inches above finished floor.

E. Inserts used shall be cast iron or steel of type to receive machine bolt head or nut after installation.

1. Inserts shall permit adjustment of bolt in one horizontal direction and shall, when installed in properly cured concrete, develop full strength of bolt.

3.9 ESCUTCHEONS

A. Escutcheons shall be installed around exposed pipe passing through finished floor, wall, or ceiling.

1. Escutcheons shall be heavy cast brass, chromium-plated, unless otherwise noted, adjustable, and shall be of sufficient outside diameter to cover sleeve opening and shall fit snugly around pipe.

3.10 INSTALLATION OF EQUIPMENT

A. Install equipment so as to avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways, to satisfaction of Engineer and in accordance with code requirements.

B. Install equipment so as to properly distribute equipment loads in building structural members provided for equipment support under other Sections.

1. Roof-mounted equipment shall be installed and supported on separate supports as previously specified.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.

E. Provide cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section Five of Code of Practice of American Institute of Steel Construction.

G. Verify site electrical conditions prior to purchase of equipment. Coordinate voltage of all equipment requiring electrical connections with EC prior to purchase. Notify engineer of any discrepancies.

H. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly, which will void warranty.

1. Report in writing to Engineer, prior to purchase or shipment of equipment involved, on conditions, which may prevent proper installation.

3.11 ADJUSTING

A. Provide start-up service, make any required adjustments and efficiency tests, and provide one, minimum three-hour instruction periods to owner's representative at the site.

1. This is in addition to the separately specified control system training.

B. Include a minimum of three separate visits to the site after substantial completion for the purpose of assisting the Owner's representatives in proper operation.

3.12 PIPING AND FITTINGS

A. Install piping as required for a complete installation. Conform to the best practice of the trade.

1. See drawings for correct pipe sizing and locations.

2. Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.

3. After completion, fill, clean, drain and refill systems; pressure test boiler piping.

B. Provide shut-offs at the base of each riser, at each major piece of equipment and at appropriate locations to facilitate service of components.

C. Provide balancing valves at the outlet of all hydronic coils and radiation.

D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

E. Install valves with stems upright or horizontal, not inverted.

F. Install unions at equipment that does not have flanged connections between equipment and isolation valves.

3.13 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas-and water-tight. Jointing shall be types specified for service indicated. Joints and connections shall meet requirements of manufacturers best recommended practice. All transitions between different piping materials shall be made using approved adapters. Adapters for transitions between two types of piping materials shall be manufactured for purpose intended.

3.14 EXPANSION PROVISIONS

A. Installation of piping must allow for expansion using offsets, loops, swing joints, expansion joints, etc. as shown and as necessary to prevent undue strain.

1. Take-offs from mains to runouts shall not have less than three elbow swings.

B. Mains and risers with loops or offsets shall be securely anchored to structure so as to impart expansion towards loops or offsets.

1. Anchors shall be constructed of heavy forged wrought iron, secured to pipe and to structure.

2. Provide vibration isolation as required.

C. Provide pipe alignment guides as required to guide expanding pipe to move freely from anchor points toward expansion joints, offsets, etc.

3.15 SYSTEM CLEANING

A. Piping

1. After piping has been pressure tested and approved for tightness, clean and flush piping.

a. Refill with clean water and repeat until system is cleaned of residual dirt and oil.

b. Remove, inspect, and clean strainer screens.

c. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed.

B. Heating system shall be operational, filled, started, and vented prior to cleaning. Place control valves in open position during cleaning.

1. Schedule a qualified water quality treatment company representative to provide a hydronic system cleaner, such as Hydro-Solv 9100 as manufactured by Rhomar. Follow manufacturer's instructions for solution strength, duration, heating, etc.. Open all valves and circulate through all system elements.

2. Flush system to remove all traces of the cleaner. The qualified water quality treatment company representative should test the water quality and report in writing.

3. Apply heat while circulating water within the entire hydronic system, slowly raising temperature to 180 degrees F and maintain for 12 hours minimum.

a. Remove heat and circulate to 100 degrees F or less; drain systems as quickly as possible and refill with clean water.

b. Circulate for six hours at near steaming temperature, then drain.

c. Refill with clean water and repeat until system is cleaned of residual dirt and oil.

d. Remove, inspect, and clean strainer screens.

e. Inspect, remove sludge, and flush low points with clean water after cleaning process is completed.

f. Include disassembly of components as required.

4. After final fill, purge air from all system components.

3.16 HYDRONIC SYSTEM WATER TREATMENT

A. The existing hydronic system includes propylene glycol antifreeze. Provide the services of a qualified water quality treatment company to conduct testing and ensure adequate concentrations are maintained when filling new piping.

3.17 TESTING, INSPECTION, BALANCING AND ADJUSTING

A. General

1. Provide the services of an independent test and balance company certified by the ABA who shall supply qualified personnel, equipment, apparatus and services for testing, inspection, balancing and adjusting of Mechanical systems, to performance data shown in schedules, as specified, and as required by codes, standards, regulations and authorities having jurisdiction including City Inspectors, Owner and Engineer.

   a. Notify Engineer and involved authorities at least 48 hours prior to testing or inspection.

   b. Do not cover work (this includes application of insulation) prior to testing or inspection.

2. Testing, inspection, balancing and adjusting shall in no way relieve or reduce guarantee requirements.

3. The Mechanical systems are not to be considered substantially complete until the test and balance work is complete and the submitted paper work detailing results has been approved by the engineer.

4. Submit proposed test procedures, recording forms and test equipment for review prior to testing and balancing.

5. Notify Engineer and authorities involved at least 48 hours prior to testing.

6. Do not cover or conceal work prior to testing and inspection and obtaining approval.

7. Prior to date of acceptance, furnish Engineer with certificates of testing and inspection for Mechanical systems indicating approval of authorities having jurisdiction and conformance with requirements of Contract Documents.

   a. Instruments used for testing and balancing shall have been calibrated with six months prior to testing or balancing.

   b. Calibration shall be certified.

8. Leaks, damage and defects discovered or resulting from tests shall be repaired or replaced to like-new condition with acceptable materials.

   a. Tests shall be continued until system operates without adjustments or repairs.

9. Report on standard reporting forms.

10. Submit six copies of testing and balancing reports to Engineer for approval.

11. Prove capacity and performance of equipment by field testing. Install equipment and instruments required for testing, thermo-wells and gauge connections at no additional cost to Owner.

12. Qualified representative of equipment manufacturer shall be present at test.

13. Tests: No tests shall be started until systems have been flushed.

    a. Fill system and allow to sit for 24 hours or more.

    b. Drain and refill system.

    c. Provide temporary piping and connections for testing, flushing, or draining systems to be tested.

    d. If leaks develop, repairs shall be made and tests repeated.

    e. Tests shall be continued until systems operate without adjustments and repair to equipment or piping.

    f. Tests are further specified under other paragraphs of this Section.

B. Hydronic Piping Systems

1. Leak tests shall be conducted in accordance with ANSI B31.9 "Building Service Piping" and as specified herein.

2. Test system to 1.5 times working pressure, but not less than 100 psig.

    a. Pipe shall be capable of holding test pressure for a minimum of fifteen (15) minutes with no perceivable pressure reduction.

    b. Test shall be conducted using compressed air.

3. Test shall be documented by the contractor and written report shall be provided to the engineer.

4. Equipment shall be valved off or removed during test if equipment pressure rating is less than test pressure.

5. Where more than one pipe is being installed and tested, testing shall be performed individually unless otherwise approved by Engineer.

6. Leaks discovered during testing shall be repaired at no cost to Owner; retest system.

C. Test and Balance for Fan Coil Units and air systems

1. Measure air quantities at all outlets and adjust related manual balancing damper. Airflow shall be balanced between 100% and 120% of specified flow rate.

2. Use volume control devices to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

3. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

END OF SECTION

DIVISION 25
DIRECT DIGITAL CONTROLS
(DDC) SYSTEM

SECTION 250000

DIRECT DIGITAL CONTROL (DDC) SYSTEM

(AUTOMATIC TEMPERATURE CONTROLS)

PART 1: GENERAL

1.1 GENERAL REQUIREMENTS

A. Include the General Conditions of the Contract and Division 1, General Requirements, as part of this Section.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work of this Section with that of all other trades affecting, or affected by, this Section. Cooperate with such trades to assure the steady progress of all work under the contract.

1.2 SCOPE OF WORK

A. Included in this Section is the furnishing of all labor, materials, equipment and accessories required to provide a complete installation of the work described herein and on the Drawings. Build the work of other trades into the work of this Section as required.

B. Give notices, file plans, obtain permits and licenses, pay fees and backcharges and obtain necessary approvals from authorities having jurisdiction, as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda, all of which are part of Contract Documents.

C. The work under this Section consists of:

1. This section provides the specifications for the upgrade and extension of the existing Direct Digital Control (DDC) Automatic Temperature Control (ATC) system. Included are the equipment specifications and control strategies. Control shall be accomplished with intelligent field panels, all networked to a front end PC.

2. Provide control of new HVAC equipment as identified on drawings. Provide all required programming and equipment including, field controllers, wiring, carbon dioxide transmitters, pressure transducers, thermostats, temperature sensors, and electronic actuators.

3. Provide new Automation Server and new BACnet MS/TP trunk to new field controllers. Controllers can be viewed and commanded via a web services from browser from any front end. The new automation server shall communicate to the existing LonWorks network.

4. New classroom FCU's (typ-6)

    a. Heating only (no cooling)

    b. O - Fan

    c. I - Fan status

    d. I - Supply air temp sensor

    e. O - 2-way hot water valve

    f. I/O - thermostat/temperature sensor

    g. (DCV: I - Carbon Dioxide (CO_2), O - outside air damper)

5. ERV (typ-1)

    a. ERV includes factory controls with a DDC interface.

b. Provide pressure transducers and control output to new variable speed roof top ERVs.

6. VAV Boxes: Supply DDC VAV controller for installation by VAV manufacturer

   a. O - damper control

   b. I - pressure transducer

   c. O - 2-way hot water valve (hot water heating for some)

   d. I/O - thermostat/temperature sensor

7. Fan Powered VAV Boxes: Supply DDC VAV controller for installation by VAV manufacturer.

   a. O - Fan

   b. I - Fan status

   c. O - damper control

   d. I - pressure transducer

   e. O - 2-way hot water valve

   f. I/O - thermostat/temperature sensor

8. Cafe: Baseboard heating

   a. O - 2-way hot water valve

   b. I/O - thermostat/temperature sensor

1.3 RELATED DOCUMENTS

A. All work of this Division shall be coordinated and provided by the Building Management System (BMS) Contractor.

B. The work of this Division shall be as required by the Specifications, Point Schedules and Drawings.

C. If the BMS Contractor believes there are conflicts or missing information in the project documents, the Contractor shall promptly request clarification and instruction from the design team.

1.4 EXISTING CONDITIONS

A. The existing DDC system includes a LON bus architecture that is serviced and maintained by ENE Systems, Inc. of Canton, MA. The existing system shall remain in place to serve existing HVAC that is not modified by this project.

1.5 DEFINITIONS

A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.

B. Binary: A two-state system where an “ON” condition is represented by one discrete signal level and an “OFF” condition is represented by a second discrete signal level.

C. Building Management System (BMS): The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by this Division BMS Contractor and to be interfaced to the associated work of other related trades.

D. BMS Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary manufacturer, installer, commissioner and ongoing service provider for the BMS work.

E. Control Sequence: A BMS pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.

F. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the BMS software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

G. BMS Network: The total digital on-line real-time interconnected configuration of BMS digital processing units, workstations, panels, sub-panels, controllers, devices and associated elements individually known as network nodes. May exist as one or more fully interfaced and integrated sub-networks, LAN, WAN or the like.

H. Node: A digitally programmable entity existing on the BMS network.

I. BMS Integration: The complete functional and operational interconnection and interfacing of all BMS work elements and nodes in compliance with all applicable codes, standards and ordinances so as to provide a single coherent BMS as required by this Division.

J. Provide: The term “Provide” and its derivatives when used in this Division shall mean to furnish, install in place, connect, calibrate, test, commission, warrant, document and supply the associated required services ready for operation.

K. PC: Personal Computer from a recognized major manufacturer

L. Furnish: The term “Furnish” and its derivatives when used in this Division shall mean supply at the BMS Contractor’s cost to the designated third party trade contractor for installation. BMS Contractor shall connect furnished items to the BMS, calibrate, test, commission, warrant and document.

M. Wiring: The term “Wiring” and its derivatives when used in this Division shall mean provide the BMS wiring and terminations.

N. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.

O. Protocol: The term “protocol” and its derivatives when used in this Division shall mean a defined set of rules and standards governing the on-line exchange of data between BMS network nodes.

P. Software: The term “software” and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the BMS industry for real-time, on-line, integrated BMS configurations.

Q. The use of words in the singular in these Division documents shall not be considered as limiting when other indications in these documents denote that more than one such item is being referenced.

R. Headings, paragraph numbers, titles, shading, bolding, underscores, clouds and other symbolic interpretation aids included in the Division documents are for general information only and are to assist in the reading and interpretation of these Documents.

S. The following abbreviations and acronyms may be used in describing the work of this Division:

ADC	-	Analog to Digital Converter
AHJ	-	Authority Having Jurisdiction
AI	-	Analog Input
AN	-	Application Node
ANSI	-	American National Standards Institute
AO	-	Analog Output
ASCII	-	American Standard Code for Information Interchange

ASHRAE		American Society of Heating, Refrigeration and Air Conditioning Engineers
AWG	-	American Wire Gauge
CPU	-	Central Processing Unit
CRT	-	Cathode Ray Tube
DAC	-	Digital to Analog Converter
DCV	-	Demand Controlled Ventilation
DDC	-	Direct Digital Control
DI	-	Digital Input
DO	-	Digital Output
EEPROM	-	Electronically Erasable Programmable Read Only Memory
EMI	-	Electromagnetic Interference
FAS	-	Fire Alarm Detection and Annunciation System
GUI	-	Graphical User Interface
HOA	-	Hand-Off-Auto
ID	-	Identification
IEEE	-	Institute of Electrical and Electronics Engineers
I/O	-	Input/Output
IT	-	Information Technology
LAN	-	Local Area Network
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
MCC	-	Motor Control Center
NC	-	Normally Closed
NIC	-	Not In Contract
NO	-	Normally Open
OWS	-	Operator Workstation
OAT	-	Outdoor Air Temperature
PC	-	Personal Computer
RAM	-	Random Access Memory
RF	-	Radio Frequency
RFI	-	Radio Frequency Interference
RH	-	Relative Humidity
ROM	-	Read Only Memory
RTD	-	Resistance Temperature Device
SPDT	-	Single Pole Double Throw
SPST	-	Single Pole Single Throw
XVGA	-	Extended Video Graphics Adapter
TBA	-	To Be Advised
TCP/IP	-	Transmission Control Protocol/Internet Protocol
TTD	-	Thermistor Temperature Device
UPS	-	Uninterruptible Power Supply
UV	-	Unit Ventilator
VAC	-	Volts, Alternating Current
VAV	-	Variable Air Volume
VDC	-	Volts, Direct Current
WAN	-	Wide Area Network

1.6 BMS DESCRIPTION

A. The Building Management System (BMS) shall be a complete system designed for use with the enterprise IT systems. This functionality shall extend into the equipment rooms. Devices residing on the automation network located in equipment rooms and similar shall be fully IT compatible devices that mount and communicate directly on the IT infrastructure in the facility. Contractor shall be responsible for coordination with the owner's IT staff to ensure that the BMS will perform in the owner's environment without disruption to any of the other activities taking place on that LAN.

B. All points of user interface shall be on standard PCs that do not require the purchase of any special software from the BMS manufacturer for use as a building operations terminal. The primary point of interface on these PCs will be a standard Web Browser.

C. The work of the single BMS Contractor shall be as defined individually and collectively in all Sections of this Division specification together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents.

D. The BMS work shall consist of the provision of all labor, materials, tools, equipment, software, software licenses, software configurations and database entries, interfaces, wiring, tubing, installation, labeling, engineering, calibration, documentation, samples, submittals, testing, commissioning, training services, permits and licenses, transportation, shipping, handling, administration, supervision, management, insurance, temporary protection, cleaning, cutting and patching, warranties, services, and items, even though these may not be specifically mentioned in these Division documents which are required for the complete, fully functional and commissioned BMS.

E. Provide a complete, neat and workmanlike installation. Use only manufacturer employees who are skilled, experienced, trained, and familiar with the specific equipment, software, standards and configurations to be provided for this Project.

F. Manage and coordinate the BMS work in a timely manner in consideration of the Project schedules. Coordinate with the associated work of other trades so as to not impede or delay the work of associated trades.

G. The BMS as provided shall incorporate, at minimum, the following integrated features, functions and services:

1. Operator information, alarm management and control functions.
2. Enterprise-level information and control access.
3. Information management including monitoring, transmission, archiving, retrieval, and reporting functions.
4. Diagnostic monitoring and reporting of BMS functions.
5. Offsite monitoring and management access.
6. Energy management
7. Standard applications for terminal HVAC systems.

1.7 QUALITY ASSURANCE

A. General

1. The Building Management System Contractor shall be the primary manufacturer-owned branch office that is regularly engaged in the engineering, programming, installation and service of total integrated Building Management Systems.
2. The BMS Contractor shall be a recognized national manufacturer, installer and service provider of BMS.
3. The BMS Contractor shall have a branch facility within a 100 mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7 day-a-week basis.
4. As evidence and assurance of the contractor's ability to support the Owner's system with service and parts, the contractor must have been in the BMS business for at least the last

ten (10) years and have successfully completed total projects of at least 10 times the value of this contract in each of the preceding five years.

5. The Building Management System architecture shall consist of the products of a manufacturer regularly engaged in the production of Building Management Systems, and shall be the manufacturer's latest standard of design at the time of bid.

B. Workplace Safety and Hazardous Materials

1. Provide a safety program in compliance with the Contract Documents.
2. The BMS Contractor shall have a corporately certified comprehensive Safety Certification Manual and a designated Safety Supervisor for the Project.
3. The Contractor and its employees and subtrades shall comply with federal, state and local safety regulations.
4. The Contractor shall ensure that all subcontractors and employees have written safety programs in place that covers their scope of work, and that their employees receive the training required by the OSHA rules that have jurisdiction for at least each topic listed in the Safety Certification Manual.
5. Hazards created by the Contractor or its subcontractors shall be eliminated before any further work proceeds.
6. Hazards observed but not created by the Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The Contractor shall be required to avoid the hazard area until the hazard has been eliminated.
7. The Contractor shall sign and date a safety certification form prior to any work being performed, stating that the Contractors' company is in full compliance with the Project safety requirements.
8. The Contractor's safety program shall include written policy and arrangements for the handling, storage and management of all hazardous materials to be used in the work in compliance with the requirements of the AHJ at the Project site.
9. The Contractor's employees and subcontractor's staff shall have received training as applicable in the use of hazardous materials and shall govern their actions accordingly.

C. Quality Management Program

1. Designate a competent and experienced employee to provide BMS Project Management. The designated Project Manger shall be empowered to make technical, scheduling and related decisions on behalf of the BMS Contractor. At minimum, the Project Manager shall:
   a. Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
   b. Manage the financial aspects of the BMS Contract.
   c. Coordinate as necessary with other trades.
   d. Be responsible for the work and actions of the BMS workforce on site.

1.8 REFERENCES

A. All work shall conform to the following Codes and Standards, as applicable:

1. National Fire Protection Association (NFPA) Standards.
2. National Electric Code (NEC) and applicable local Electric Code.
3. Underwriters Laboratories (UL) listing and labels.
4. UL 268 Smoke Detectors.
5. UL 916 Energy Management

6. NFPA 70 - National Electrical Code.
7. NFPA 90A - Standard For The Installation Of Air Conditioning And Ventilating Systems.
8. Factory Mutual (FM).
9. American National Standards Institute (ANSI).
10. National Electric Manufacturer's Association (NEMA).
11. American Society of Mechanical Engineers (ASME).
12. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
13. Air Movement and Control Association (AMCA).
14. Institute of Electrical and Electronic Engineers (IEEE).
15. American Standard Code for Information Interchange (ASCII).
16. Electronics Industries Association (EIA).
17. Occupational Safety and Health Administration (OSHA).
18. American Society for Testing and Materials (ASTM).
19. Federal Communications Commission (FCC) including Part 15, Radio Frequency Devices.
20. Americans Disability Act (ADA)
21. ANSI/EIA 909.1-A-1999 (LonWorks)
22. ANSI/ASHRAE Standard 195-2008 (BACnet)

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.9 SUBMITTALS

A. Shop Drawings, Product Data, and Samples

1. Submittals shall be in defined packages. Each package shall be complete and shall only reference itself and previously submitted packages. The packages shall be as approved by the Engineer for Contract compliance.
2. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the BMS Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.
3. Prepare an index of all submittals and shop drawings for the installation. Index shall include a shop drawing identification number, Contract Documents reference and item description.
4. The BMS Contractor shall correct any errors or omissions noted in the first review.
5. At a minimum, submit the following:
    a. BMS network architecture diagrams including all nodes and interconnections.
    b. Systems schematics, sequences and flow diagrams.
    c. Points schedule for each point in the BMS, including: Point Type, Object Name, Expanded ID, Display Units, Controller type, and Address.
    d. Samples of Graphic Display screen types and associated menus.
    e. Detailed Bill of Material list for each system or application, identifying quantities, part numbers, descriptions, and optional features.
    f. Control Damper Schedule including a separate line for each damper provided under this section and a column for each of the damper attributes, including: Code

Number, Fail Position, Damper Type, Damper Operator, Duct Size, Damper Size, Mounting, and Actuator Type.

g. Control Valve Schedules including a separate line for each valve provided under this section and a column for each of the valve attributes: Code Number, Configuration, Fail Position, Pipe Size, Valve Size, Body Configuration, Close off Pressure, Capacity, Valve CV, Design Pressure, and Actuator Type.

h. Room Schedule including a separate line for each terminal unit indicating location and address

i. Details of all BMS interfaces and connections to the work of other trades.

j. Product data sheets or marked catalog pages including part number, photo and description for all products including software.

1.10 RECORD DOCUMENTATION

A. Operation and Maintenance Manuals

1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the BMS provided:

a. Table of contents.

b. As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.

c. Manufacturers product data sheets or catalog pages for all products including software.

d. System Operator's manuals.

e. Archive copy of all site-specific databases and sequences.

f. BMS network diagrams.

g. Interfaces to all third-party products and work by other trades.

2. The Operation and Maintenance Manual CD shall be self-contained, and include all necessary software required to access the product data sheets. A logically organized table of contents shall provide dynamic links to view and print all product data sheets. Viewer software shall provide the ability to display, zoom, and search all documents.

1.11 1.9 WARRANTY

A. Standard Material and Labor Warranty:

1. Provide a one-year labor and material warranty on the BMS.

2. If within twelve (12) months from the date of acceptance of product, upon written notice from the owner, it is found to be defective in operation, workmanship or materials, it shall be replaced, repaired or adjusted at the option of the BMS Contractor at the cost of the BMS Contractor.

PART 2: PART 2 – PRODUCTS

2.1 GENERAL DESCRIPTION

A. The Building Management System (BMS) shall use an open architecture and fully support a multi-vendor environment. To accomplish this effectively, the BMS shall support open communication protocol standards and integrate a wide variety of third-party devices and applications. The system shall be designed for use on the Internet, or intranets using off the shelf, industry standard technology compatible with other owner provided networks.

B. The Building Management System shall consist of the following:

1. Automation Server
2. Field Equipment Controller(s)
3. Input/Output Module(s)
4. Local Display Device(s)
5. Portable Operator's Terminal(s)
6. Distributed User Interface(s)
7. Network processing, data storage and communications equipment
8. Other components required for a complete and working BMS

C. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, controllers and operator devices, while re-using existing controls equipment.

D. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

1. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.
2. The System shall maintain all settings and overrides through a system reboot.

E. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution.

F. Acceptable Manufacturers

1. Schneider Electric/TAC
2. Johnson Controls, Metasys
3. Honeywell, Enterprise Building Integrator (EBI)

2.2 BMS ARCHITECTURE

A. Automation Network

1. The automation network shall be based on a PC industry standard of Ethernet TCP/IP. Where used, LAN controller cards shall be standard “off the shelf” products available through normal PC vendor channels.
2. All BMS devices on the automation network shall be capable of operating at a communication speed of 100 Mbps, with full peer-to-peer network communication.
3. Automation Server (SmartStruxure) shall reside on the automation network.
4. The automation network will be compatible with other enterprise-wide networks. Where indicated, the automation network shall be connected to the enterprise network and share resources with it by way of standard networking devices and practices.

B. Control Network

1. Network Automation Engines (NAE) shall provide supervisory control over the control network and shall support all three (3) of the following communication protocols:
   a. BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9
      1) The NAE shall be BACnet Testing Labs (BTL) certified and carry the BTL Label.
      2) The NAE shall be tested and certified as a BACnet Building Controller (B-BC).
   b. LonWorks enabled devices using the Free Topology Transceiver (FTT-10a).
   c. The Johnson Controls N2 Field Bus.

2. Control networks shall provide either “Peer-to-Peer,” Master-Slave, or Supervised Token Passing communications, and shall operate at a minimum communication speed of 9600 baud.

3. DDC Controllers shall reside on the control network.

4. Control network communication protocol shall be BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135.

5. A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided for each controller device (master or slave) that will communicate on the BACnet MS/TP Bus.

C. Integration

1. Hardwired

a. Analog and digital signal values shall be passed from one system to another via hardwired connections.

b. There will be one separate physical point on each system for each point to be integrated between the systems.

2. Direct Protocol (Integrator Panel)

a. The BMS system shall include appropriate hardware equipment and software to allow bi-directional data communications between the BMS system and 3rd party manufacturers' control panels. The BMS shall receive, react to, and return information from HVAC systems, including but not limited to air handling units, boilers, unit ventilators, variable frequency drives.

b. All data required by the application shall be mapped into the Automation Engine's database, and shall be transparent to the operator.

c. Point inputs and outputs from the third-party controllers shall have real-time interoperability with BMS software features such as: Control Software, Energy Management, Custom Process Programming, Alarm Management, Historical Data and Trend Analysis, Totalization, and Local Area Network Communications.

3. BACnet Protocol Integration - BACnet

a. The neutral protocol used between systems will be BACnet over Ethernet and comply with the ASHRAE BACnet standard 135-2008.

b. A complete Protocol Implementation Conformance Statement (PICS) shall be provided for all BACnet system devices.

c. The ability to command, share point object data, change of state (COS) data and schedules between the host and BACnet systems shall be provided.

2.3 USER INTERFACE

A. Dedicated Web Based User Interface

1. The BMS Contractor shall use the Owners PC for command entry, information management, network alarm management, and database management functions. All real-time control functions, including scheduling, history collection and alarming, shall be resident in the BMS Network Automation Engines to facilitate greater fault tolerance and reliability.

2. PC Hardware :

a. Owner to furnish PC.

B. Distributed Web Based User Interface

1. All features and functions of the dedicated user interface previously defined in this document shall be available on any computer connected directly or via a wide area or virtual private network (WAN/VPN) to the automation network and conforming to the following specifications.

2. The software shall run on the Microsoft Internet Explorer (6.0 or higher) browser supporting the following functions:
    a. Configuration
    b. Commissioning
    c. Data Archiving
    d. Monitoring
    e. Commanding
    f. System Diagnostics
3. Minimum hardware requirements:
    a. 1GB RAM
    b. 2.0 GHz Clock Speed Pentium 4 Microprocessor
    c. 100 GB Hard Drive.
    d. 1 Keyboard with 83 keys (minimum).
    e. SVGA 1024x768 resolution display with 64K colors and 16 bit color depth
    f. Mouse or other pointing device

C. Site Management User Interface Application Components

1. Operator Interface
    a. An integrated browser based client application shall be used as the user operator interface program.
    b. The System shall employ an event-driven rather than a device polling methodology to dynamically capture and present new data to the user.
    c. All Inputs, Outputs, Setpoints, and all other parameters as defined within Part 3, shown on the design drawings, or required as part of the system software, shall be displayed for operator viewing and modification from the operator interface software.
    d. The user interface software shall provide help menus and instructions for each operation and/or application.
    e. The system shall support customization of the UI configuration and a home page display for each operator.
    f. The system shall support user preferences in the following screen presentations:
        1) Alarm
        2) Trend
        3) Display
        4) Applications
    g. All controller software operating parameters shall be displayed for the operator to view/modify from the user interface. These include: setpoints, alarm limits, time delays, PID tuning constants, run-times, point statistics, schedules, and so forth.
    h. The Operator Interface shall incorporate comprehensive support for functions including, but not necessarily limited to, the following:
        1) User access for selective information retrieval and control command execution
        2) Monitoring and reporting
        3) Alarm, non-normal, and return to normal condition annunciation
        4) Selective operator override and other control actions

5) Information archiving, manipulation, formatting, display and reporting

6) BMS internal performance supervision and diagnostics

7) On-line access to user HELP menus

8) On-line access to current BMS as-built records and documentation

9) Means for the controlled re-programming, re-configuration of BMS operation and for the manipulation of BMS database information in compliance with the prevailing codes, approvals and regulations for individual BMS applications

i. The system shall support a list of application programs configured by the users that are called up by the following means:

1) The Tools Menu

2) Hyperlinks within the graphics displays

3) Key sequences

j. The operation of the control system shall be independent of the user interface, which shall be used for operator communications only. Systems that rely on an operator workstation to provide supervisory control over controller execution of the sequences of operations or system communications shall not be acceptable.

2. Navigation Trees

a. The system will have the capability to display multiple navigation trees that will aid the operator in navigating throughout all systems and points connected. At minimum provide a tree that identifies all systems on the networks.

b. Provide the ability for the operator to add custom trees. The operator will be able to define any logical grouping of systems or points and arrange them on the tree in any order. It shall be possible to nest groups within other groups. Provide at minimum 5 levels of nesting.

c. The navigation trees shall be "dockable" to other displays in the user interface such as graphics. This means that the trees will appear as part of the display, but can be detached and then minimized to the Windows task bar. A simple keystroke will reattach the navigation to the primary display of the user interface.

3. Alarms

a. Alarms shall be routed directly from Network Automation Engines to PCs and servers. It shall be possible for specific alarms from specific points to be routed to specific PCs and servers. The alarm management portion of the user interface shall, at the minimum, provide the following functions:

1) Log date and time of alarm occurrence.

2) Generate a "Pop-Up" window, with audible alarm, informing a user that an alarm has been received.

3) Allow a user, with the appropriate security level, to acknowledge, temporarily silence, or discard an alarm.

4) Provide the ability to direct alarms to an e-mail address or alphanumeric pager. This must be provided in addition to the pop up window described above. Systems that use e-mail and pagers as the exclusive means of annunciating alarms are not acceptable.

5) Any attribute of any object in the system may be designated to report an alarm.

b. The BMS shall annunciate diagnostic alarms indicating system failures and non-normal operating conditions.

c. The BMS shall allow a minimum of 4 categories of alarm sounds customizable through user defined wav.files.

d. The BMS shall annunciate application alarms at minimum, as required by Part 3.

4. Reports and Summaries

a. Reports and Summaries shall be generated and directed to the user interface displays, with subsequent assignment to printers, or disk. As a minimum, the system shall provide the following reports:

1) All points in the BMS

2) All points in each BMS application

3) All points in a specific controller

4) All points in a user-defined group of points

5) All points currently in alarm

6) All points locked out

7) All user defined and adjustable variables, schedules, interlocks and the like.

b. Summaries and Reports shall be accessible via standard UI functions and not dependent upon custom programming or user defined HTML pages.

c. Selection of a single menu item, tool bar item, or tool bar button shall print any displayed report or summary on the system printer for use as a building management and diagnostics tool.

d. Provide the capability to view, command and modify large quantities of similar data in tailored summaries created online without the use of a secondary application like a spreadsheet. Summary definition shall allow up to seven user defined columns describing attributes to be displayed including custom column labels. Up to 100 rows per summary shall be supported. Summary viewing shall be available over the network using a standard Web browser.

5. Schedules

a. A graphical display for time-of-day scheduling and override scheduling of building operations shall be provided. At a minimum, the following functions shall be provided:

1) Weekly schedules

2) Exception Schedules

3) Monthly calendars

b. Weekly schedules shall be provided for each group of equipment with a specific time use schedule.

c. It shall be possible to define one or more exception schedules for each schedule including references to calendars

d. Monthly calendars shall be provided that allow for simplified scheduling of holidays and special days for a minimum of five years in advance. Holidays and special days shall be user-selected with the pointing device or keyboard, and shall automatically reschedule equipment operation as previously defined on the exception schedules.

e. Changes to schedules made from the User Interface shall directly modify the Network Automation Engine schedule database.

f. Schedules and Calendars shall comply with ASHRAE SP135/2008 BACnet Standard.

g. Selection of a single menu item or tool bar button shall print any displayed schedule on the system printer for use as a building management and diagnostics tool.

h. Software shall be provided to configure and implement optimal start and stop programming based on existing indoor and outdoor environmental conditions as well as equipment operating history

6. Password

   a. Multiple-level password access protection shall be provided to allow the user/manager to user interface control, display, and database manipulation capabilities deemed appropriate for each user, based on an assigned password.

   b. Each user shall have the following: a user name (accept 24 characters minimum), a password (accept 12 characters minimum), and access levels.

   c. The system shall allow each user to change his or her password at will.

   d. When entering or editing passwords, the system shall not echo the actual characters for display on the monitor.

   e. A minimum of six levels of access shall be supported individually or in any combination as follows:

      1) Level 1 = View Data

      2) Level 2 = Command

      3) Level 3 = Operator Overrides

      4) Level 4 = Database Modification

      5) Level 5 = Database Configuration

      6) Level 6 = All privileges, including Password Add/Modify

   f. A minimum of 100 unique passwords shall be supported.

   g. Operators shall be able to perform only those commands available for their respective passwords. Display of menu selections shall be limited to only those items defined for the access level of the password used to log-on.

   h. Operators shall be further limited to only access, command, and modify those buildings, systems, and subsystems for which they have responsibility. Provide a minimum of 100 categories of systems to which individual operators may be assigned.

   i. The system shall automatically generate a report of log-on/log-off and system activity for each user. Any action that results in a change in the operation or configuration of the control system shall be recorded, including: modification of point values, schedules or history collection parameters, and all changes to the alarm management system, including the acknowledgment and deletion of alarms.

7. Screen Manager

   a. The User Interface shall be provided with screen management capabilities that allow the user to activate, close, and simultaneously manipulate a minimum of 4 active display windows plus a network or user defined navigation tree.

8. Dynamic Color Graphics

   a. The graphics application program shall be supplied as an integral part of the User Interface. Browser or Workstation applications that rely only upon HTML pages shall not be acceptable.

   b. The graphics applications shall include a create/edit function and a runtime function. The system architecture shall support an unlimited number of graphics documents (graphic definition files) to be generated and executed.

   c. The graphics shall be able to display and provide animation based on real-time data that is acquired, derived, or entered.

   d. Graphics runtime functions – A maximum of 16 graphic applications shall be able to execute at any one time on a user interface or workstation with 4 visible to the user. Each graphic application shall be capable of the following functions:

      1) All graphics shall be fully scalable

2) The graphics shall support a maintained aspect ratio.

3) Multiple fonts shall be supported.

4) Unique background shall be assignable on a per graphic basis.

5) The color of all animations and values on displays shall indicate the status of the object attribute.

6) Graphics that represent buildings or systems shall allow natural links and transitions between related detailed tabular views of data that compliment the graphic.

e. Operation from graphics – It shall be possible to change values (setpoints) and states in system controlled equipment directly from the graphic.

f. Floor Plan graphics – The user interface shall provide graphic applications that summarize conditions on a floor. Floor plan graphics shall indicate thermal comfort using dynamic colors to represent zone temperature deviations from zone setpoint(s). Floor plan graphics shall display overall metrics for each zone in the floor.

g. Aliasing – Many graphic displays representing part of a building and various building components are exact duplicates, with the exception that the various variables are bound to different field values. Consequently, it shall be possible to bind the value of a graphic display to aliases, as opposed to the physical field tags.

h. Graphic editing tool – A graphic editing tool shall be provided that allows for the creation and editing of graphic files. The graphic editor shall be capable of performing/defining all animations, and defining all runtime binding.

1) The graphic editing tool shall provide a library of standard HVAC equipment, floor plan, lighting, security and network symbols.

2) The graphic editing tool shall provide for the creation and positioning of library symbols by dragging from tool bars or drop-downs and positioning where required.

3) The graphics editing tool shall permit the importing of AutoCAD drawings for use in the system.

4) The graphic editing tool shall be able to add additional content to any graphic by importing images in the SVG, PNG or JPG file formats.

9. Historical trending and data collection

a. Each Automation Engine shall store trend and point history data for all analog and digital inputs and outputs, as follows:

1) Any point, physical or calculated, may be designated for trending. Two methods of collection shall be allowed:

a) Defined time interval

b) Upon a change of value

2) Each Automation Engine shall have the capability to store multiple samples for each physical point and software variable based upon available memory, including an individual sample time/date stamp. Points may be assigned to multiple history trends with different collection parameters.

10. Trend data viewing and analysis

a. Provide a trend viewing utility that shall have access to all database points.

b. It shall be possible to retrieve any historical database point for use in displays and reports by specifying the point name and associated trend name.

c. The trend viewing utility shall have the capability to define trend study displays to include multiple trends

d. Displays shall be able to be single or stacked graphs with on-line selectable display characteristics, such as ranging, color, and plot style.

e. Display magnitude and units shall both be selectable by the operator at any time without reconfiguring the processing or collection of data. This is a zoom capability.

f. Display magnitude shall automatically be scaled to show full graphic resolution of the data being displayed.

g. The Display shall support the user's ability to change colors, sample sizes, and types of markers.

11. Database Management

a. Where a separate SQL database is utilized for information storage the System shall provide a Database Manager that separates the database monitoring and managing functions by supporting two separate windows.

b. Database secure access shall be accomplished using standard SQL authentication including the ability to access data for use outside of the Building Automation application.

c. The database managing function shall include summarized information on trend, alarm, event, and audit for the following database management actions:

1) Backup

2) Purge

3) Restore

d. The Database Manager shall support four tabs:

1) Statistics – shall display Database Server information and Trend, Alarm (Event), and Audit information on the Metasys Databases.

2) Maintenance – shall provide an easy method of purging records from the Metasys Server trend, alarm (event), and audit databases by supporting separate screens for creating a backup prior to purging, selecting the database, and allowing for the retention of a selected number of day's data.

3) Backup – Shall provide the means to create a database backup file and select a storage location.

4) Restore – shall provide a restricted means of restoring a database by requiring the user to log into an Expert Mode in order to view the Restore screen.

e. The Status Bar shall appear at the bottom of all Metasys Database Manager Tabs and shall provide information on the current database activity. The following icons shall be provided:

1) Ready

2) Purging Record from a database

3) Action Failed

4) Refreshing Statistics

5) Restoring database

6) Shrinking a database

7) Backing up a database

8) Resetting internet information Services

9) Starting the Metasys Device Manager

10) Shutting down the Metasys Device Manager

11) Action successful

f. The Database Manager monitoring functions shall be accessed through the Monitoring Settings window and shall continuously read database information once the user has logged in.

g. The System shall provide user notification via taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

h. The Monitoring Settings window shall have the following sections:

1) General – Shall allow the user to set and review scan intervals and start times.

2) Email – Shall allow the user to create and review e-mail and phone text messages to be delivered when a Warning or Alarm is generated.

3) Warning – shall allow the user to define the Warning limit parameters, set the Reminder Frequency, and link the e-mail message.

4) Alarm – shall allow the user to define the Alarm limit parameters, set the Reminder Frequency, and link the e-mail message.

5) Database login – Shall protect the system from unauthorized database manipulation by creating a Read Access and a Write Access for each of the Trend, Alarm (Event) and Audit databases as well as an Expert Mode required to restore a database.

i. The Monitoring Settings Taskbar shall provide the following informational icons:

1) Normal – Indicates by color and size that all databases are within their limits.

2) Warning - Indicates by color and size that one or more databases have exceeded their Warning limit.

3) Alarm - Indicates by color and size that one or more databases have exceeded their Alarm limit.

j. The System shall provide user notification via Taskbar icons and e-mail messages when a database value has exceeded a warning or alarm limit.

2.4 DDC AUTOMATION SERVER

A. Provide Automation Server to control and monitor new HVAC equipment installed in this project. The Automation Server shall be the core of the system and performs key functionality such as control logic, trend logging and alarm supervision.

B. The Automation Server Automation can natively communicate with three of the most popular standards for buildings: BACnet, LonWorks, and Modbus. The server shall be configured to communicate directly to new controllers using BACnet protocol.

C. Unit has the following ports:

1. One 10/100 Ethernet port
2. Tow RS-485 ports
3. One built-in I/O bus port
4. Two USB host ports
5. Onc USB device port

D. Native web based software shall include directory browsing, read/write of current values, alarm receipt and acknowledgement and trend log data.

E. The server can control up to 464 I/O points.

F. Unit shall include terminal base and web services.

2.5 DDC SYSTEM CONTROLLERS

A. Field Equipment Controller (TAC MNB-300 Unitary Controller)

1. The Field Equipment Controller (FEC) shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol. Controller shall have the ability to function in standalone mode or part of the building automation network.
2. Controllers shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable. The FEC shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
3. The FEC shall include LED indicators to identify status and output indication.
4. The FEC shall support the following types of inputs and outputs:
    a. Universal Inputs (6) - shall be configured to monitor any of the following:
        1) Analog Input, Voltage Mode
        2) Analog Input, Current Mode
        3) Analog Input, Resistive Mode
        4) Binary Input, Dry Contact Maintained Mode
        5) Binary Input, Pulse Counter Mode
    b. Universal Outputs (3) - shall be configured to output either of the following
        1) Analog Output, Voltage Mode
        2) Analog Output, Current Mode
    c. Digital Outputs - Triac (6)
        1) 24 VAC Triac
5. The FEC shall support, but not be limited to, the following applications:
    a. Built-up air handling units for special applications
    b. Terminal & package units
    c. Zone temperature control

2.6 VAV CONTROLLERS

A. VAV controllers shall be TAC MicroNet BACnet VAV Controller MNB-Vx.
1. Controller shall have the following features:
    a. Universal inputs (3)
    b. Universal outputs (1)
    c. Digital Outputs (triac) (3)
    d. Velocity pressure input with a control range of 0.004 to 1.5" w.c.
    e. Inputs from room sensor including temperature, humidity, local setpoint and override pushbottom.
    f. Damper actuator output

2.7 FIELD DEVICES

A. Room Sensors shall be TAC MN-S3.
1. The Room Sensors shall temperature sensor with setpoint adjustment and override. The units shall have the ability to monitor the following variables:
    a. Zone Temperature
    b. Zone Humidity
    c. Zone Setpoint

2. The room sensor shall transmit the information back to the controller on the BACnet network.

3. The Network Zone Temperature Sensors shall include the following items:

   a. A backlit Liquid Crystal Display (LCD)

   b. digital zone temperature display, selectable for Fahrenheit or Celsius

   c. A button to initiate a timed override command

   d. Available in either surface mount, wall mount, or flush mount

   e. Available with either screw terminals or phone jack

2.8 INPUT DEVICES

A. General Requirements

1. Installation, testing, and calibration of all sensors, transmitters, and other input devices shall be provided to meet the system requirements.

B. Temperature Sensors

1. General Requirements:

   a. Sensors and transmitters shall be provided, as outlined in the input/output summary and sequence of operations.

   b. The temperature sensor shall be of the resistance type, and shall be either two-wire 1000 ohm nickel RTD, or two-wire 1000 ohm platinum RTD.

   c. The following point types (and the accuracy of each) are required, and their associated accuracy values include errors associated with the sensor, lead wire, and A to D conversion:

Point Type	Accuracy
Chilled Water	+ .5°F.
Room Temp	+ .5°F.
Duct Temperature	+ .5°F.
All Others	+ .75°F.

2. Room Temperature Sensors

   a. Room sensors shall be constructed for either surface or wall box mounting.

   b. Room sensors shall have the following options when specified:

      1) Setpoint reset slide switch providing a +3 degree (adjustable) range.

      2) Individual heating/cooling setpoint slide switches.

      3) A momentary override request push button for activation of after-hours operation.

      4) Analog thermometer.

3. Room Temperature Sensors with Integral Display

   a. Room sensors shall be constructed for either surface or wall box mounting.

   b. Room sensors shall have an integral LCD display and four button keypad with the following capabilities:

      1) Display room and outside air temperatures.

      2) Display and adjust room comfort setpoint.

      3) Display and adjust fan operation status.

      4) Timed override request push button with LED status for activation of after-hours operation.

5) Display controller mode.

6) Password selectable adjustment of setpoint and override modes.

C. Carbon Dioxide (CO_2) transmitter:

a. Unit shall be designed to measure and transmit CO_2 levels ranging from 0 to 2,000 parts per million for HVAC applications. Accuracy shall be +/-30 ppm CO_2 + 2.0% of reading at 77°F. Output shall be either a 0 – 10V or 0 – 20 mA.

b. Diffusion aspirated, single beam dual wavelength sensor. Sensor is silicone-based for high accuracy and long-term measurement stability (+/- 100ppm) over a five-year period without calibration.

c. Unit shall include an air collection probe consisting of a pitot tube and filter that shall be extended into the return air plenum

d. Available in either surface mount, wall mount, or duct mount.

e. Available with screw terminals or phone jack.

f. Unit shall be Senva Inc. CO2RL, or equal.

2. Thermo wells

a. When thermo wells are required, the sensor and well shall be supplied as a complete assembly, including wellhead and Greenfield fitting.

b. Thermo wells shall be pressure rated and constructed in accordance with the system working pressure.

c. Thermo wells and sensors shall be mounted in a threadolet or 1/2″ NFT saddle and allow easy access to the sensor for repair or replacement.

d. Thermo wells shall be constructed of 316 stainless steel.

3. Outside Air Sensors

a. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.

b. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.

c. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

4. Duct Mount Sensors

a. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.

b. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.

c. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

5. Averaging Sensors

a. For ductwork greater in any dimension that 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.

b. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.

c. Capillary supports at the sides of the duct shall be provided to support the sensing string.

6. Acceptable Manufacturers: Johnson Controls, Setra.

D. Humidity Sensors

1. The sensor shall be a solid-state type, relative humidity sensor of the Bulk Polymer Design. The sensor element shall resist service contamination.

2. The humidity transmitter shall be equipped with non-interactive span and zero adjustments, a 2-wire isolated loop powered, 4-20 mA, 0-100% linear proportional output.

3. The humidity transmitter shall meet the following overall accuracy, including lead loss and Analog to Digital conversion. 3% between 20% and 80% RH @ 77 Deg F unless specified elsewhere.

4. Outside air relative humidity sensors shall be installed with a rain proof, perforated cover. The transmitter shall be installed in a NEMA 3R enclosure with sealtite fittings and stainless steel bushings.

5. A single point humidity calibrator shall be provided, if required, for field calibration. Transmitters shall be shipped factory pre-calibrated.

6. Duct type sensing probes shall be constructed of 304 stainless steel, and shall be equipped with a neoprene grommet, bushings, and a mounting bracket.

7. Acceptable Manufacturers: Johnson Controls, Veris Industries, and Mamac.

E. Differential Pressure Transmitters

1. General Air and Water Pressure Transmitter Requirements:

a. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.

b. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.

c. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.

d. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible.

2. Medium to High Differential Water Pressure Applications (Over 21" w.c.)

a. The differential pressure transmitter shall meet the low pressure transmitter specifications with the following exceptions:

1) Differential pressure range 10" w.c. to 300 PSI.

2) Reference Accuracy: +1% of full span (includes non-linearity, hysteresis, and repeatability).

b. Standalone pressure transmitters shall be mounted in a bypass valve assembly panel. The panel shall be constructed to NEMA 1 standards. The transmitter shall be installed in the panel with high and low connections piped and valved. Air bleed units, bypass valves, and compression fittings shall be provided.

c. Acceptable Manufacturers: Setra and Mamac.

3. Building Differential Air Pressure Applications (-1" to +1" w.c.)

a. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.

b. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:

1) -1.00 to +1.00 w.c. input differential pressure ranges. (Select range appropriate for system application)

2) 4-20 mA output.

3) Maintain accuracy up to 20 to 1 ratio turndown.

4) Reference Accuracy: +0.2% of full span.

c. Acceptable Manufacturers: Johnson Controls; Setra.

F. Status and Safety Switches

1. General Requirements

a. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the BMS when a failure or abnormal condition occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

2. Current Sensing Switches

a. The current sensing switch shall be self-powered with solid-state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.

b. Current sensing switches shall be used for run status for fans, pumps, and other miscellaneous motor loads.

c. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

d. Acceptable manufacturer: Veris Industries

3. Air Filter Status Switches

a. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120VAC.

b. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.

c. Provide appropriate scale range and differential adjustment for intended service.

d. Acceptable manufacturers: Johnson Controls, Cleveland Controls.

4. Air Flow Switches

a. Differential pressure flow switches shall be bellows actuated mercury switches or snap acting micro-switches with appropriate scale range and differential adjustment for intended service.

b. Acceptable manufacturers: Johnson Controls, Cleveland Controls.

5. Air Pressure Safety Switches

a. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120VAC.

b. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.

c. Acceptable manufacturers: Johnson Controls, Cleveland Controls.

6. Water Flow Switches

a. Water flow switches shall be equal to the Johnson Controls P74.

7. Low Temperature Limit Switches

a. The low temperature limit switch shall be of the manual reset type with Double Pole/Single Throw snap acting contacts rated for 16 amps at 120VAC.

b. The sensing element shall be a minimum of 15 feet in length and shall react to the coldest 18-inch section. Element shall be mounted horizontally across duct in accordance with manufacturers recommended installation procedures.

c. For large duct areas where the sensing element does not provide full coverage of the air stream, additional switches shall be provided as required to provide full protection of the air stream.

d. The low temperature limit switch shall be equal to Johnson Controls A70.

2.9 OUTPUT DEVICES

A. Actuators

1. General Requirements

a. Damper and valve actuators shall be electronic as specified in the System Description section.

2. Electronic Damper Actuators

a. Electronic damper actuators shall be direct shaft mount.

b. Modulating and two-position actuators shall be provided as required by the sequence of operations. Damper sections shall be sized based on actuator manufacturer's recommendations for face velocity, differential pressure and damper type. The actuator mounting arrangement and spring return feature shall permit normally open or normally closed positions of the dampers, as required. All actuators (except terminal units) shall be furnished with mechanical spring return unless otherwise specified in the sequences of operations. All actuators shall have external adjustable stops to limit the travel in either direction, and a gear release to allow manual positioning.

c. Modulating actuators shall accept 24 VAC or VDC power supply, consume no more than 15 VA, and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA, and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal and may be used to parallel other actuators and provide true position indication. The feedback signal of one damper actuator for each separately controlled damper shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

d. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Isolation, smoke, exhaust fan, and other dampers, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop associated fan. Two-position actuators, as specified in sequences of operations as "quick acting," shall move full stroke within 20 seconds. All smoke damper actuators shall be quick acting.

e. Acceptable manufacturers: Johnson Controls, Mamac.

3. Electronic Valve Actuators

a. Electronic valve actuators shall be manufactured by the valve manufacturer.

b. Each actuator shall have current limiting circuitry incorporated in its design to prevent damage to the actuator.

c. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the

valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.

d. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.

e. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or chiller.

f. Acceptable manufacturers: Johnson Controls

B. Control Relays

1. Control Pilot Relays

a. Control pilot relays shall be of a modular plug-in design with retaining springs or clips.

b. Mounting Bases shall be snap-mount.

c. DPDT, 3PDT, or 4PDT relays shall be provided, as appropriate for application.

d. Contacts shall be rated for 10 amps at 120VAC.

e. Relays shall have an integral indicator light and check button.

f. Acceptable manufacturers: Johnson Controls, Lectro

C. Control Valves

1. All automatic control valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating loads, as specified. All control valves shall be suitable for the system flow conditions and close against the differential pressures involved. Body pressure rating and connection type (sweat, screwed, or flanged) shall conform to the pipe schedule elsewhere in this Specification.

D. Electronic Signal Isolation Transducers

1. A signal isolation transducer shall be provided whenever an analog output signal from the BMS is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input signal from a remote system.

2. The signal isolation transducer shall provide ground plane isolation between systems.

3. Signals shall provide optical isolation between systems.

4. Acceptable manufacturers: Advanced Control Technologies

E. External Manual Override Stations

1. External manual override stations shall provide the following:

a. An integral HAND/OFF/AUTO switch shall override the controlled device pilot relay.

b. A status input to the Facility Management System shall indicate whenever the switch is not in the automatic position.

c. A Status LED shall illuminate whenever the output is ON.

d. An Override LED shall illuminate whenever the HOA switch is in either the HAND or OFF position.

e. Contacts shall be rated for a minimum of 1 amp at 24 VAC.

2.10 MISCELLANEOUS DEVICES

A. Local Control Panels

1. All control panels shall be factory constructed, incorporating the BMS manufacturer's standard designs and layouts. All control panels shall be UL inspected and listed as an assembly and carry a UL 508 label listing compliance. Control panels shall be fully enclosed, with perforated sub-panel, hinged door, and slotted flush latch.

2. In general, the control panels shall consist of the DDC controller(s), display module as specified and indicated on the plans, and I/O devices-such as relays, transducers, and so forth-that are not required to be located external to the control panel due to function. Where specified the display module shall be flush mounted in the panel face unless otherwise noted.

3. All I/O connections on the DDC controller shall be provide via removable or fixed screw terminals.

4. Low and line voltage wiring shall be segregated. All provided terminal strips and wiring shall be UL listed, 300-volt service and provide adequate clearance for field wiring.

5. All wiring shall be neatly installed in plastic trays or tie-wrapped.

6. A 120 volt convenience outlet, fused on/off power switch, and required transformers shall be provided in each enclosure.

B. Power Supplies

1. DC power supplies shall be sized for the connected device load. Total rated load shall not exceed 75% of the rated capacity of the power supply.

2. Input: 120 VAC +10%, 60Hz.

3. Output: 24 VDC.

4. Line Regulation: +0.05% for 10% line change.

5. Load Regulation: +0.05% for 50% load change.

6. Ripple and Noise: 1 mV rms, 5 mV peak to peak.

7. An appropriately sized fuse and fuse block shall be provided and located next to the power supply.

8. A power disconnect switch shall be provided next to the power supply.

PART 3: PERFORMANCE / EXECUTION

3.1 BMS SPECIFIC REQUIREMENTS

A. Graphic Displays

1. (system diagrams and flow graphics are not required).

B. Custom Reports:

1. Provide custom reports as required for this project:

C. Actuation / Control Type

1. Primary Equipment

a. Controls shall be provided by equipment manufacturer as specified herein.

b. All damper and valve actuation shall be electric.

2. Air Handling Equipment

   a. *All air handers shall be controlled with a HVAC-DDC Controller*

   b. *All damper and valve actuation shall be electric.*

3. Terminal Equipment:

   a. *All Terminal Units (UV, CUH, etc) shall be controlled with HVAC-DDC Controller)*

   b. *Terminal Units shall have electric damper and valve actuation.*

3.2 INSTALLATION PRACTICES

A. BMS Wiring

1. All conduit, wiring, accessories and wiring connections required for the installation of the Building Management System, as herein specified, shall be provided by the BMS Contractor unless specifically shown on the Electrical Drawings under Division 26 Electrical. All wiring shall comply with the requirements of applicable portions of Division 26 and all local and national electric codes, unless specified otherwise in this section.

2. All BMS wiring materials and installation methods shall comply with BMS manufacturer recommendations.

3. The sizing, type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the BMS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the BMS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.

4. Class 2 Wiring

   a. *All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.*

   b. *Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5' from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines. All wiring shall be installed in accordance with local code requirements.*

5. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.

6. Provide for complete grounding of all applicable signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

B. BMS Line Voltage Power Source

1. 120-volt AC circuits used for the Building Management System shall be taken from panel boards and circuit breakers provided by Division 26.

2. Circuits used for the BMS shall be dedicated to the BMS and shall not be used for any other purposes.

3. DDC terminal unit controllers may use AC power from motor power circuits.

C. BMS Raceway

1. All wiring shall be installed in conduit or raceway except as noted elsewhere in this specification. Minimum control wiring conduit size 1/2".

2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Engineer.

3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.

4. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed.

D. Penetrations

1. Provide fire stopping for all penetrations used by dedicated BMS conduits and raceways.
2. All openings in fire proofed or fire stopped components shall be closed by using approved fire resistive sealant.
3. All wiring passing through penetrations, including walls shall be in conduit or enclosed raceway.
4. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

E. BMS Identification Standards

1. Node Identification. All nodes shall be identified by a permanent label fastened to the enclosure. Labels shall be suitable for the node location.
2. Cable types specified in Item A shall be color coded for easy identification and troubleshooting.

F. BMS Panel Installation

1. The BMS panels and cabinets shall be located as indicated at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
2. The BMS contractor shall be responsible for coordinating panel locations with other trades and electrical and mechanical contractors.

G. Input Devices

1. All Input devices shall be installed per the manufacturer recommendation
2. Locate components of the BMS in accessible local control panels wherever possible.

H. HVAC Input Devices – General

1. All Input devices shall be installed per the manufacturer recommendation
2. Locate components of the BMS in accessible local control panels wherever possible.
3. The mechanical contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
4. Outside Air Sensors
   a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
   b. Sensors shall be installed with a rain proof, perforated cover.
5. Water Differential Pressure Sensors
   a. Differential pressure transmitters used for flow measurement shall be sized to the flow-sensing device.
   b. Differential pressure transmitters shall be supplied with tee fittings and shut-off valves in the high and low sensing pick-up lines.
   c. The transmitters shall be installed in an accessible location wherever possible.
   d. Air bleed units, bypass valves and compression fittings shall be provided.
6. Building Differential Air Pressure Applications (-1" to +1" w.c.):
   a. Transmitters exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.

b. The interior tip shall be inconspicuous and located as shown on the drawings.

7. Duct Temperature Sensors:

a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.

b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.

c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.

d. The sensor shall be mounted to suitable supports using factory approved element holders.

8. Space Sensors:

a. Shall be mounted per ADA requirements.

b. Provide lockable tamper-proof covers in public areas and/or where indicated on the plans.

9. Low Temperature Limit Switches:

a. Install on the discharge side of the first water or steam coil in the air stream.

b. Mount element horizontally across duct in a serpentine pattern insuring each square foot of coil is protected by 1 foot of sensor.

c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.

10. Air Differential Pressure Status Switches:

a. Install with static pressure tips, tubing, fittings, and air filter.

11. Water Differential Pressure Status Switches:

a. Install with shut off valves for isolation.

I. HVAC Output Devices

1. All output devices shall be installed per the manufacturers recommendation. The mechanical contractor shall install all in-line devices such as control valves, dampers, airflow stations, pressure wells, etc.

2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke. When any pneumatic actuator is sequenced with another device, pilot positioners shall be installed to allow for proper sequencing.

3. Control Dampers: Shall be opposed blade for modulating control of airflow. Parallel blade dampers shall be installed for two position applications.

4. Control Valves: Shall be sized for proper flow control with equal percentage valve plugs. The maximum pressure drop for water applications shall be 5 PSI. The maximum pressure drop for steam applications shall be 7 PSI.

5. Electronic Signal Isolation Transducers: Whenever an analog output signal from the Building Management System is to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. Signals shall provide optical isolation between systems

3.3 TRAINING

A. The BMS contractor shall provide the following training services:

1. One day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings, the BMS software layout and naming conventions, and a walk through of the facility to identify panel and device locations.

PART 4: SEQUENCE OF OPERATION

4.1 GENERAL

A. It is the intent of this specification to provide a complete, direct digital, and fully automated Energy Management System for control of selected Mechanical equipment and provide the Owner with optimum energy savings and reliability. The manufacturer and installer shall work closely with the Engineer, and Owner to provide the optimum control sequence. The following sequences are intended as a guideline only. It is the manufacturer's responsibility to submit a detailed sequence of operation for review and approval by the engineer.

4.2 DESCRIPTION OF WORK ELEMENTS

A. Occupied/Unoccupied Control

1. The occupied/unoccupied schedules for the Mechanical systems are determined by the DDC.
2. Control Action: Each output will be capable of being programmed independently of the others. The DDC will allow for 365 day programming, with any facility holidays and vacations programmed in advance. Each point shall be capable of being overridden with a single snow day command.

B. Energy Recovery Ventilator (ERV)

1. Unit shall be enabled to operate based on Occupied/Unoccupied Schedule. Manufacturer controls provide control of enthalpy wheel, exhaust fan, supply fan and inlet dampers. The BMS shall monitor and provide status for control points. The BMS shall display alarm sensed by the manufacturer controller.
2. The BMS shall send supply air pressure setpoints to the ERV controller to modulate the variable speed drive based on the static pressure sensor located in the supply air ductwork. The BMS shall read the status on the sensor and display the pressure reading on the status screen.
3. The exhaust fan shall be variable speed and shall track the operation of the supply air fan.

C. Classroom Fan Coil Units

1. Unit shall operate based on Occupied/Unoccupied Schedule
2. Occupied Mode: The unit shall maintain
   a. A 74°F (adj.) cooling setpoint
   b. A 70°F (adj.) heating setpoint.
3. Unoccupied Mode (night setback): The unit shall maintain
   a. A 85°F (adj.) cooling setpoint.
   b. A 55°F (adj.) heating setpoint.
4. AHU Optimal Start:
   a. The unit shall start prior to scheduled occupancy based on the time necessary for the zones to reach their occupied set points. The start time shall automatically adjust based on changes in outside air temperature and zone temperatures.
5. Supply Fan:

a. The supply fan shall run anytime the unit is commanded to run, unless shutdown on safeties. To prevent short cycling, the supply fan shall have a user definable (adj.) minimum runtime.

b. Alarms shall be provided as follows:

1) Supply Fan Failure: Commanded on, but the status is off.

2) Supply Fan in Hand: Commanded off, but the status is on.

3) Supply Fan Runtime Exceeded: Status runtime exceeds a user definable limit (adj.).

c. Supply fan shall operate continuously during the schedule occupancy.

d. Supply fan shall operate on call for either heating or cooling during unoccupied periods.

6. Heating Coil Valve:

a. The controller shall measure the supply air temperature and modulate the heating coil valve to maintain its heating setpoint.

b. The heating shall be enabled whenever:

1) Outside air temperature is less than 65°F (adj.).

2) AND the supply fan status is on.

3) AND the cooling (if present) is not active.

c. Alarms shall be provided as follows:

1) High Supply Air Temp: If the supply air temperature is greater than 120°F (adj.).

2) Low Supply Air Temp: If the supply air temperature is 5°F (adj.) less than setpoint.

7. Outside Air for Ventilation

a. Provide Demand Controlled Ventilation (DCV) to modulate outside air in response to CO_2 level. During the occupied schedule the outside air dampers shall modulate to maintain a maximum indoor CO_2 concentration of 600ppm above the ambient outdoor CO_2 concentration.

b. Outside air dampers shall be closed during unoccupied hours.

D. Fan Powered VAV Boxes

1. VAV boxes provide temperature control in response to local space temperature sensor.

2. During morning warm-up primary air damper shall be closed.

3. During morning cool down, primary air damper shall be open.

4. Fan shall operate continuously during scheduled occupancy.

5. Fan shall operate on call for either heating or cooling during unoccupied period.

6. On a rise in space temperature above the setpoint, the primary air damper shall modulate open between the minimum and maximum positions. On a fall in space temperature, the opposite will occur.

7. On a fall in space temperature below the setpoint, the controller shall modulate the hot water heating valve open.

E. Hydronic Finned tube baseboard

1. When indoor temperature is less than the heating setpoint, the controller shall open the associated convector heating valve.

2. When indoor temperature is greater than the heating setpoint, the controller shall close the associated convector heating valve.

END OF SECTION

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SECTION 26 00 00

ELECTRICAL (FILED SUB BID)

PART 1 – GENERAL

1.0 FILING SUB-BID REQUIREMENT

A. The Acoustical Tile Ceilings filed sub-bid includes the Work specified in the following Sections:
   1. 26 00 00 Electrical

B. Submit sub-bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, Sections 44A-44H, inclusive, as amended. The time and place of submission of sub-bids is set forth in the INSTRUCTIONS TO BIDDERS.

C. With each sub-bid, submit bid security in the form of a BID BOND, or CERTIFIED CHECK on, or a TREASURER'S or CASIHER'S CHECK issued by, a responsible bank or trust company, payable to the TOWN OF BEDFORD, MASSACHUSETTS, in the amount of five percent (5%) of the bid amount. A bid bond shall be (a) in a form satisfactory to Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid.

D. Submit each sub-bid for the work of this Section on a form furnished by the Awarding Authority.

E. The Work of this section is shown on the following Drawings: SE-1, E-1.0, E-1.1, E-1.2, E-1.3, E-1.4, E-1.5, E-3.0, E-3.1, FA-1.0 & FA-1.1
   1. Electrical Drawings
      a. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing Title Sheet, as modified by Addenda.

1.1 RELATED DOCUMENTS

A. This section supplements the General Conditions.

B. Consult the individual sections of the specifications for specific items required under those sections.

1.2 SCOPE OF WORK

A. The scope of work consists of the installation of all materials to be furnished under this Section, and without limiting the generality thereof, includes all equipment, labor and services required for the furnishing, delivering, and installing the principal items of work hereinafter and all items incidental thereto as specified herein and as shown on the drawings.

B. The itemization of work hereinafter specified does not in any way limit the responsibility to perform all work and furnish all the equipment, labor, and materials necessary for completion and satisfaction of operation of the installations described in the Specifications and shown on the Contract Drawings. In addition to the principal and miscellaneous items of work specifically mentioned and/or indicated, to be responsible for furnishing and installing all incidental and collateral materials such as supporting hardware for panelboards, conduit hangers, fastening devices, insulating tape and the like, which constitute essential components of the grade of Electrical Trade Practices and Workmanship acceptable to the Engineer.

1. Building electrical distribution system modifications.
2. Building electric switchboard modifications.
3. Distribution feeders.
4. Lighting and power panels.
5. Raceways.
6. Branch circuit wiring.
7. Lighting fixtures.
8. Wiring devices and device plates.
9. Drilling and coring.
10. Cutting and patching.
11. Sealing and waterproofing openings for conduit services through building foundations.
12. Wiring and connection of electrical equipment supplied by the Owner.
13. Wiring devices.
14. Nameplates and labels.
15. Outlet boxes.
16. Exterior lighting contactors and associated control system.
17. Photocells for exterior lighting control system.
18. Disconnect switches.
19. Junction boxes and pull boxes.
20. Wireways and wiring troughs.
21. Hangers and anchoring equipment.
22. Surface metal raceway.
23. Fire alarm system modifications and reprogramming.
24. Cable television system modifications.
25. Building data system modifications.
26. Security system modifications.
27. Television surveillance conduit system.
28. Sound system modifications.
29. Master clock system modifications .
30. Data system modifications and associated wiring.
31. Back charges by the Bedford Fire Department to test the building fire alarm system.

1.3 RELATED WORK

A. The following work is not included in this Section and is to be performed under the designated Sections:

1. Charges for current consumed by the temporary light and power system for construction shall be paid by the General Contractor.

1.4 BREAKDOWN

A. The Contractor must submit a breakdown of his contract price to aid the Engineer in determining the value of work installed as the job progresses.

B. No requisition will be paid to The Contractor until after the breakdown is delivered to the Engineer.

C. Breakdown shall consist of, not less than the following items by building. Item 9 shall be identified by type of unit in each building. The figure for each item shall include costs of material, labor, markup, and all other costs applicable to the item.

1. Main electric switchboard modifications.
2. Lighting fixtures and associated branch circuit wiring.
3. Wiring devices and associated branch circuit wiring.
4. Installation of lighting control equipment.
5. Hangers and anchoring equipment.
6. Bedford Fire Department backcharges.
7. Cutting, patching drilling and coring.
8. Exterior lighting system with associated branch circuit wiring.
9. Nameplates.
10. Lighting control system.
11. Fire alarm system modifications .
12. Cable television system modifications .
13. Telephone system modifications.
14. Extension of the existing data system.
15. Clock and program system modifications.
16. Sound system modifications .
17. Television surveillance system.
18. Existing panelboard modifications.

1.5 PRODUCT DATA SHEETS

A. Prepare and submit product data sheets of all equipment, labels, tags, and nameplates supplied under this Section of the Specifications to the Contractor for approval, as specified under General Conditions and Supplementary Conditions and Section 01300 Submittals. No work shall be done until product data sheets have been approved.

B. Shop drawings shall show plans, details, layouts and job conditions and relationship to other work.

1.6 RECORD DRAWINGS "AS-BUILTS"

A. Prepare, maintain and submit record drawings "As-Built" on reproducible Mylar drawings as well as an electronic format compatible with AutoCAD Release 12 in accordance with the General Conditions of the specifications and Section 01700 Project Closeout.

1.7 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

A. The Contractor shall instruct to the Owner's satisfaction, such persons as the Owner designates in the proper operation and maintenance of the systems and their parts.

B. Furnish in accordance with provisions under "Special Conditions" operating and maintenance manuals and forward same to the Engineer.

C. The operating instructions shall be specific for each system and shall include copies of posted specific instructions.

D. For maintenance purposes, provide shop drawings, parts lists, specifications, and manufacturer's maintenance bulletins for each piece of equipment. Provide name, address, and telephone number of the manufacturer's representative and service company, for each piece of equipment so that service or spare parts can be readily obtained.

1.8 SAMPLES

A. Submit samples as requested by the Engineer of all materials specified herein in accordance with General Condition and Supplementary Conditions, and before ordering materials obtain approval from the Engineer.

1.9 LAWS, ORDINANCES, CODES AND PERMITS

A. The Contractor shall give all necessary notices, obtain all permits, and pay all taxes, fees and other costs in connection with his work; file all necessary plans, prepare all necessary documents and obtain all necessary approvals of state authorities, all local, town, city, or county departments having jurisdiction; obtain all required certificates of inspection for his work.

B. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings in addition to Contract Drawings and Documents, in order to comply with all applicable laws, ordinances, rules and regulations whether or not shown on the drawings and/or specified.

C. All materials furnished and all work installed shall comply with the rules and recommendations of the National Electrical Code, the National Board of Fire

Underwriters', all requirements of the local utility company, recommendations from the fire insurance rating organizations having jurisdiction, and with the requirements of all state, local, town, city, or county departments having jurisdiction.

1.10 DEFINITIONS

A. "The Contractor" means specifically the Contractor responsible for the entire contract.

B. "Furnish and Install or "Provide" means to supply, erect, install and connect up, complete for regular operation, the particular work referred to unless otherwise specified. "Piping" includes in addition to pipe, all fittings, boxes, hangers and other accessories relating to such piping. "Concealed" means hidden from sight as in trenches, chases, furred spaces, shafts, hung ceilings, embedded into construction, ground or concealed as defined above.

1.11 INSPECTION AND TEST

A. All work will be subject to the inspection of the Engineer and such other inspections are may have jurisdiction.

B. As the various part of the works are installed and/or revised, insulation resistance test shall be made to insure that the new systems are free from short circuits and grounds and that all connections, switches, controls and equipment are in proper operating condition.

C. The installation resistance between conductors and between conductors and grounds, for the distribution systems shall be not less than the requirements of the National Electrical Code.

D. All testing equipment necessary shall be provided. The tests shall incur no additional expense to the Owner.

E. Failure or defects in workmanship or materials revealed by tests shall be corrected promptly and retested. Defective materials furnished under this contract shall be replaced at no additional expense to the Owner.

1.12 CODES AND STANDARDS

A. Installation shall comply in all details with the National Electrical code with its latest revisions and all prevailing local, Federal and State Regulations.

1.13 EXAMINATION OF SITE AND CONTRACT DOCUMENTS

A. Before submitting prices or beginning work, thoroughly make an examination of the site and the Contract Documents.

B. No claim for extra compensation will be recognized if difficulties are encountered which an examination of site conditions and Contract Documents prior to executing contract would have revealed.

C. The drawings showing layout of the electrical systems indicate the approximate location of outlets, apparatus and equipment. The runs of feeders and branch circuits as shown on the drawings are schematic only, and are not intended to show the exact routing of the wire; the final determination as to the routing of the wire shall be governed by structural conditions and other obstructions. This shall not be construed to mean that the design of the system may change; it merely refers to the exact run of a raceway between given points.

D. The right to make any reasonable change in the location of outlets, apparatus and equipment up to the time of roughing-in is reserved by the Owner without involving any additional expense to the Owner.

E. The Drawings and these specifications are complementary with one another, any labor or materials called for by either, whether or not by both, or necessary for the successful operation of any of the particular types of equipment furnished under this contact, shall be furnished and installed.

F. Before installing any work, see that it does not interfere with the clearance required for finished columns, pilasters, partitions or walls, as shown on the contract drawings and details.

G. Be responsible for all materials delivered to the site in connection with the work and pay all charges for cartage, scaffolds, planking, rigging and erecting. Take every precaution necessary to protect equipment and installation in addition to plugging and protecting open ends of all pipes, outlet boxes, panelboxes, and junction boxes. All equipment must be stored in a clean dry place to preserve the quality of materials being used. Equipment and/or materials damaged during the construction period shall be replaced at no additional cost to the Owner.

H. All materials and equipment required by this Electrical Specification shall be new, clean, and free of defects at the time of installation. The manufacturer's and Underwriter's label shall be on all materials and equipment unless otherwise approved, in writing, by the Engineer.

1.14 SUBSTITUTION OF MATERIALS OR EQUIPMENT

A. If the Contractor wishes to use materials or equipment other than those specifically designated herein, as being equal to those so specifically designated; BEFORE PURCHASING AND/OR FABRICATION, he shall submit the proposed substitution in accordance with the requirements of the GENERAL CONDITIONS, supported by sufficient proof of equality, the successful Contractor will be required to furnish the specifically named items designated under the base bid.

B. If the apparatus or materials substituted for those specified necessitate changes or additional connections, piping supports, or construction: same shall be provided and the Contractor shall assume the cost and the entire responsibility thereto.

C. The Engineer's permission to make such substitutions shall not relieve the Contractor from full responsibility for the work.

1.15 DAMAGE TO OTHER WORK

A. Each Contractor shall be held responsible for and shall pay for all damage to other work caused by his work or workmen.

B. Repairing of such damage shall be done by the Contractor who installed the work, and so directed by the Engineer.

1.16 COORDINATION OF TRADES

A. The Contractor shall give cooperation to other trades and shall furnish (in writing, with copies to the Engineer) any information necessary to permit the work of all trades to be installed satisfactorily and with the least possible interference or delay. Where the work of The Contractor will be installed in close proximity to work of other trade, or where there is evidence that the work of The Contractor will interfere with work of other trades, he shall assist in working our space conditions to make a satisfactory adjustment. If so directed by the Engineer, The Contractor shall prepare composite working drawings and sections, in conjunction with other trades at a suitable scale not less than 1/4" - 1"-0", clearly showing the installation of his work in relation to the work of other trades. If The Contractor installs his work before coordinating with other trades, or so as to cause interference with work of other trades, he shall make necessary changes in his work to correct the conditions without extra charge. All cutting, patching, excavation and backfilling, except for primary electrical service, shall be done by the Contractor. The Contractor shall inform the Contractor well in advance as to his requirements, and if, in the Engineer's judgment, he is negligent in this respect, The Contractor shall bear all expenses flowing from his negligence with respect thereof.

1.17 PROCEDURE

A. The Contractor shall provide all labor and materials necessary for the complete and substantial execution of the work, including all transportation, scaffolding, apparatus, utensils, tools, etc., requisite for the faithful performance of the work to the true intent and meaning of the Specifications, Drawings, and Instructions. All workmanship and materials shall be of the best of their respective kinds.

B. The Contractor shall store his material and equipment prior to installation only where designated by the Owner. He shall be responsible for all his property stored on the premises and shall hold the Owner free from liability for loss by theft or carelessness of employees of the Owner, or of other Contractors. The Contractor must take particular care to protect any finished work from injury caused thereto by his operations. After completion of the work, The Contractor shall remove all waste, rubbish and other materials left as a result of his operations and leave the premises in clean condition.

1.18 FIELD MEASUREMENTS

A. The Contractor shall verify in the field all measurements necessary for his work and shall assume responsibility for their accuracy.

1.19 CLEANING AND PROTECTION

A. All materials and equipment shall be carefully protected during shipment and protected during installation and properly handled and stored at the job site so as to prevent damage. The Contractor shall assume full responsibility for protection of work until its completion and final acceptance.

B. Upon completion of this work, The Contractor shall clean all fixtures and equipment and replace damaged parts. Upon failure of The Contractor to fulfill his obligation, this work will be taken care of at his expense.

1.20 GUARANTEE

A. All materials, items of equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in materials and workmanship for a period of not less than one (1) year from the date of final acceptance of the work.

1.21 CLEANING UP

A. The Contractor shall, at the completion of the work, clean, polish and/or wash all exposed items of material, equipment and fixtures in his contract so as to leave such items bright and clean. Special attention being given to interiors and exteriors of all panels, electrical equipment, and enclosures.

B. All painted metal surfaces which have been scratched, dented or marred shall be re-painted by the Contractor.

C. After completion of the work, the Contractor shall remove all waste, rubbish and other materials left as a result of his operation and leave the premises in clean condition.

D. At the completion of each work day, the Contractor shall remove all waste, rubbish and other material in each dwelling unit. In addition, the contractor shall wet mop all areas disturbed by work personal during the workday.

1.22 CONFLICT BETWEEN PLANS AND SPECIFICATIONS

A. In case of a conflict between contract plans and the specification the Engineer will decide which takes precedence.

1.23 SUPERINTENDENCE OF WORK

A. The Contractor shall give his personal superintendence to the work and shall retain at the job site during the period of construction, a competent foreman, satisfactory to the Engineer, who shall be in full charge or the work under this Section.

1.24 SITE VISITATION

A. The Contractor shall be required to visit the site and to have examined the existing conditions which may affect his work under this Contract. Failure to do so shall be his responsibility and no claims for extra compensation or extension of time shall be allowed because of lack of compliance herewith.

1.25 COOPERATION AND WORK PROGRESS

A. The electrical wiring shall be carried on under the usual construction conditions, in conjunction with all other work at the site. The Contractor shall cooperate with the Engineer and all contractors and equipment suppliers working on the site, coordinate the work, and proceed in a manner so as not to delay the progress the project.

B. The Contractor shall coordinate his work with the progress of the building and other trades so that he shall complete his work as soon as conditions permit. Any overtime hours worked or additional costs incurred due to lack of or improper coordination with other trades of the Owner by the Contractor shall be assumed by the Contractor without any additional cost to the Owner.

C. The Contractor has a responsibility to coordinate the exact mounting arrangement and location of equipment indicated on the Drawings to allow for proper space requirements for equipment access, operation and maintenance. Particular attention shall be given in the field to such group installations. If it is questionable that insufficient space or conflict with the work of other contractors, or Architectural or structural obstructions will result in an arrangement which will prevent proper access, operation or maintenance of the indicated equipment, the Contractor shall immediately notify the Engineer and not proceed with this part of the contract work until definite instructions have been given to him by the Engineer.

D. It shall be the responsibility of the Contractor to coordinate the delivery of electrical equipment to the project prior to the time installation of equipment will be required; but he also shall make sure such equipment is not delivered too far in advance of such required installation, to assure that possible damage and deterioration of such equipment will not occur. Such equipment stored for an excessively long period of time (as determined in the opinion of the Engineer) on the project site prior to installation may be subject to rejection by the Engineer.

1.26 REFERENCES

A. Installation shall comply in all details with the Massachusetts Electrical Code with its latest revisions and all prevailing local, Federal and State regulations.

B. Material and equipment shall be Underwriters' laboratories, Inc., listed, where a standard has been established.

C. Manufacturers' names and nomenclature facilitates descriptions of certain materials and equipment and are used to establish type, quality and function.

D. Unless otherwise specified, all work shall be manufactured, tested and installed in accordance with the latest editions of applicable publications and standards of the following organizations:

1. American Society for Testing and Material (ASTM).
2. Underwriters' Laboratories, Inc. (U.L.)
3. Insulated Power Cable Engineers Association (IPCEA).
4. National Electrical Manufacturers Association (NEMA).
5. Institute of Electrical and Electronic Engineers (IEEE).
6. American National Standards Institute (ANSI).
7. National Fire Protection Association (NFPA).
8. National Electrical Code as amended by the Massachusetts Electrical Code (MEC).
9. American Concrete Institute (ACI).

E. Should specifications, Engineer's instructions, laws, ordinances or public authority require any special tests or approvals, arrange for these and give the Engineer timely notice. If the inspection is by another authority other than the Engineer, notify the Engineer of the dates fixed for such inspection.

F. Make all reasonable tests required by the Engineer to provide the integrity of the electrical installation and leave the entire installation properly adjusted and in operating condition. After connections are made test the insulation resistance of all parts of the electrical work except that which is not furnished under this Specification. All wiring shall be so installed that when completed the system will be free from short circuits and from unintentional grounds.

G. Where reference is made to Codes and Standards these shall be interpreted as minimum requirements. Requirements in excess of these codes and Standards may be indicated on the Drawings or in the Specifications and shall be so included in the contract work. Compliance with such code requirements only shall not be construed as fulfillment of the contract work, where the plans and/or Specifications indicate additional work which may exceed such code standards.

H. Copies of NEMA, NFPA, and NEC shall be made available by the Contractor at the job site.

PART 2 - PRODUCTS

2.1 RIGID STEEL CONDUIT

A. All rigid steel conduit shall be standard IPS, galvanized or sheradized, threaded conduit equal to Pittsburgh Standard, J & L or Youngstown. Conduit installed in slabs on grade shall be wrought iron.

B. Changes in direction of conduit, where concealed, shall be made by means of standard radius bends, and where exposed, or by means of galvanized, or sheradized threaded condulets as manufactured by Crouse-Hinds or equal.

C. Conduits shall be continuous from junction or pull boxes and shall enter and be secured to all boxes in such a manner that each system shall be electrically

continuous from service to all outlets. Terminals of all conduits shall be furnished with double lock nuts and grounding bushings.

2.2 ELECTRICAL METALLIC TUBING

A. Electrical metallic tubing may be used for main feeders to light and power panels.

B. Tubing shall be continuous between outlets, making a continuous electrical system for bonding.

C. Connector and couplings shall be set screw type.

2.3 FLEXIBLE METALLIC CONDUIT

A. Flexible metallic conduit may be used for short connections to recessed fixtures and motors, except in wet areas. In wet areas liquid tight flexible metallic conduit shall be used.

2.4 WIRES AND CABLES

A. All conductor wire and cable shall consist of thoroughly tinned 98% conductivity copper, with 600 volt insulation, manufactured in strict accordance with the requirements of the Board of Underwriters' and AIEE.

B. No wires smaller than No. 12 shall be used for any branch circuit unless noted on plans for special system circuits. Larger sizes shall be used where so indicated on the Drawings.

C. All 600 volt wire and cables shall be single conductor suitable for use in wet areas and dry locations; shall have an insulation that is moisture and heat resistant cross linked thermosetting polyethylene without an outer jacket, shall be type "THHN" as manufactured by General Electric, Okonite or Rome Cable. Wire sized No. 12 and No. 10 AWG shall be solid. Sizes 8 and larger shall be stranded.

2.5 ARMORED CABLE

A. For all armored cable branch circuits as called for elsewhere in these specifications and noted on the plans, furnish and install the indicated sizes with copper conductors, with green insulated grounding conductor as manufactured by the Boston Insulated Wire Company or approved equal as manufactured by American or Collyer. Armored cable shall be type "MC" and may be installed in all stud partitions.

2.6 SURFACE METAL RACEWAYS

A. 700 Series Wiremold

1. Surface metal raceways shall be used to provide power and or lighting branch circuits and low tension as shown on the building plans.
2. The Contractor shall furnish and install all surface metal raceways and appropriate fittings to provide a safe and complete installation.

3. The surface metal raceway and fittings shall be the 700 series (ivory) as manufactured by the Wiremold company or approved equal as manufactured by Walker.
4. The raceway shall consist of a base and cover section factory assembled and designed to accommodate pulling conductors through the raceway. The base section shall have a nominal material thickness of .040" and be manufactured of zinc plated or galvanized steel. The cover section shall have a nominal material thickness of .040" and be painted with a baked enamel finish which is capable of being over-painted in the field if required.
5. The overall dimensions of the raceways shall be 3/4" w x 21 x 32" h for 700. A full complement of fittings must be available including, but not limited to, bushings to prevent wire abrasion, single and multiple gang boxes to accommodate device installation for both new work and extensions of existing work adapters from conduit to raceway, transitions to both larger and smaller surface metal raceways, 90 degree elbows, tees, fixture boxes and flexible sections to allow uninterrupted continuation of raceway along semicircular or curved surfaces.
6. The raceway manufacturer shall also have available a line of tools to aid in the installation of the raceway and components. This offering shall include a bender for forming offsets in the raceway, wire pulleys to facilitate guiding wires around inside corners, and a fish tape for pulling conductors through the raceway.
7. The surface metal raceway and fittings shall meet all requirements of the National Electrical Code Article 352A and shall be listed by Underwriters' Laboratories, Inc. in full compliance with their standard for surface metal raceways and fittings. (UL-5)

2.7 OUTLET BOXES

A. Furnish and install all required outlet boxes as manufactured by Appleton, National, or Steel City.

B. All outlet boxes for concealed work shall be galvanized, stamped steel; those for fixtures, furnished with a fixture stud.

C. Outlet boxes shall be of size and type to accommodate (1) structural conditions, (2) size and number of raceways, conductors or cables entering, and (3) devices or fixtures for which required.

D. Wall outlets shall be 4" sq. x 1-1/2" deep with plaster covers to suit, or Standard "new work" wall case boxes. Wall boxes shall be designed for rigid metallic conduit and shall be the best type for the wall construction involved.

E. Install blank plates on all outlet boxes, in which no apparatus is installed, which do not integrally provide a cover for the box.

F. Special care shall be taken to set all boxes correctly square and true with the building finish. As far as possible, all wall and switch outlets shall be erected in advance of furring and fireproofing, and shall be secured to the building structure or steel by adjustable strap iron supports, which shall be buried in.

G. The exact location of all outlets and switches in finished rooms shall be obtained from the Engineer and from the Scale Drawings of interior details and finish. Final correct readjustment shall be made to the outlets if necessary to give proper centering.

H. In centering of outlets and location of outlet boxes, allow for overhead pipes, and thickness of fireproofing and plastering; also for window trim, paneling, hung ceilings and the like. Any inaccuracy resulting from failure to do so must be corrected under this Section of the Specifications without expense to the Owner. Confer with the Engineer and other Subcontractors and find out where hung ceilings occur and piping and ductwork run before signing the Contract and include in proposal whatever costs of the electrical work these conditions necessitate.

I. The locations given or designated on the Drawings for the outlets are subject to modification. In the case of local wall switches established by the swing of the door. In all cases, the switch shall be on the side of the door opposite the hinges.

2.8 JUNCTION AND PULL BOXES

A. Junction or pull boxes shall be furnished and installed under this Section of the Specifications where indicated on the Drawings and wherever else such a box may be deemed necessary to facilitate the pulling or splicing of wires or cables.

B. All such boxes must be made accessible and shall be built only from approved detail Working Drawings. Conduits shall enter these boxes through tight fitting clearance holes.

C. The covers of the boxes shall be designed for quick removal. Where junction boxes are required for a splicing box for special recessed fixtures, consult the Engineer before installing boxes for these fixtures and determine the exact location of the boxes.

D. Each feeder passing through a pull box shall be tagged or designated in some other approved manner. If tags are used, they shall be of fireproof material.

E. Locations of junction boxes and pull boxes shall meet the approval of the Engineer. Generally, junction boxes and pull boxes shall not be exposed in finished spaces; where necessary re-route conduits or make other arrangements to meet the approval of the Engineer.

F. Junction boxes or pull boxes used with unmetered electric feeders shall be provided with hasps and shall be sealed with a utility company entrance seal.

G. A nameplate shall be installed on the junction box or pull box cover indicating that the cover shall not be removed without contacting the utility company to reseal the junction box or pull box.

2.9 LIGHTING FIXTURES

A. The Contractor shall furnish and install the lighting fixtures, complete for each and every light outlet in the type, quality and size of fixture indicated on the

Drawings in the fixture schedule unless called specifically to be omitted herein. It shall be the responsibility of The Contractor to check the Drawings with the schedule for completeness, as the schedule is made up for the convenience of the bidders. In the schedule, catalog numbers are used and size of fixture that will be required.

B. The Contractor shall include all fixtures, wiring, hanging, uncrating, connecting up and making ready for operation. All fixture wires for fixtures shall not be less than #16 gauge, but larger if capacity of fixture requires it, and furnished with type "THHN" insulated covered wire where exposed to excessive heat.

C. The Contractor shall include the cost of furnishing and installing all lamps for all fixtures under this Contract throughout.

D. The Contractor shall check structural and architectural details of all locations where fixtures are to be installed so that he can properly provide for installation of the fixture.

2.10 PANELBOARDS (120/208 Volt)

A. Panels shall be type “NQOD” bolted as manufactured by Square “D”, Siemens, Cutler Hammer or General Electric.

B. The panelboard schedule indicates the details as to size, voltage, capacity and number of circuits necessary, including spares.

C. The panelboard shall conform to the requirements of the Underwriters’ label.

D. The panelboard shall be designed for operation at 120/208 volts 3 phase 5 wire.

E. Circuit breakers 2 and 3-pole for 120/208 volts application shall be type “QOB” switch rated 22,000 amps interrupting capacity as indicated on drawings. Circuit breakers shall be bolt-on type.

F. Furnish 10 circuit breaker locks for branch circuit locking control.

G. All locks of all panels shall be operated by a common master key.

H. Furnish and install on the inside cover of all light and power panels, a neatly typed index, giving the circuit number; and opposite each number the area of equipment which that particular circuit serves or controls.

I. In connecting branch circuits to panels, care shall be taken to insure balance; and circuit numbering shown on plans shall be changed to prevent same circuits on same phase being connected to a common neutral.

J. Panelboards shall be furnished with hinged trim with door and door covers to provide easy access to the panelboard interior, without removing the panelboard cover.

K. Panelboard bussing shall be aluminum and shall meet the requirements of the Owner.

2.11 NAMEPLATES

A. Nameplates consisting of black mica with white center, lettering to be 1/4" high engraved through to white layer and properly fastened with brass screws shall be provided for the following equipment:

1. Switchgear.
2. Contactors.
3. Disconnect switches.
4. Magnetic starters.
5. Terminal cabinets.
6. Panelboards.
7. Fire alarm control panel.
8. Junction boxes.
9. Contractor shall note branch circuit number terminated at each disconnect switch servicing mechanical system terminal box.

2.12 LIGHT SWITCHES

A. All local wall switches shall be of the flush tumbler type, single-pole, double-pole, 3-way or 4-way as required, as manufactured by Hubbell, P & S or Bryant.

B. Local switches shall be installed in such a position that they shall bear evenly and true and be secured on the axis of the supporting members.

C. Under no circumstances are wooden wedges, shims or blocks to be used in truing up local switches. Should the outlet box, in any case, come too far back of the finished surface, recess boxes and screws of the proper length to reach the box shall be used of such a size as to form a shoulder at exactly the proper point to retain the switch in position.

D. Single-pole switches shall be Hubbell #1221WH or equal as manufactured by Eaton or Legrand.

E. Three-way switches shall be Hubbell #1223WH and 4-way switches shall be Hubbell #1224WH.

F. Switch and pilot shall be 1221-PL.

2.13 RECEPTACLES

A. All convenience outlets shall be of the single or duplex type, back or side-wired. T-slot or polarized slot type, grounded as required, as manufactured by Hubbell, Eaton or Legrand.

B. In general, convenience outlet circuits shall be independent of light circuits and shall not be controlled by light circuit breaker switches or light switches.

C. Duplex receptacles shall be equal to Hubbell 5252-WH.

D. Single receptacles rated at 20A-250V shall be Hubbell 5451-WH.

E. Single receptacles rated at 30A-250V 1 phase shall be Hubbell 2620A.

F. Single receptacles rated at 50A-250V 1 phase shall be Hubbell CS8269.

G. Single receptacles rated at 20A-250V 3 phase shall be Hubbell 2420A.

H. Single receptacles rated at 30A-250V 3 phase shall be Hubbell 2721.

I. Single receptacles rated at 50A-250V 3 phase shall be Hubbell 3769.

J. Single receptacles rated at 20A-125/250V 1 phase shall be Hubbell 7310B.

K. Single receptacles rated at 30A-125/250V 1 phase shall be Arrow Hart 5744.

L. Single receptacles rated at 50A-125/250V 1 phase shall be Arrow Hart 5754.

M. Ground fault receptacles shall be Leviton 8899.

2.14 WIRING DEVICE PLATES

A. All device plates shall be stainless steel. Plates shall be of appropriate type and size for all wiring and control devices, signal and telephone outlets.

B. Plates shall be set so that all edges are in contact with the mounting surface. Plaster fillings will not be allowed. Multi-device locations shall have one common device plate.

C. Device plates shall be by the same manufacturer as devices.

D. Plates for surface type boxes shall not overlap boxes and shall be designed for use with surface boxes.

2.15 DISCONNECT SWITCH

A. Furnish and install safety switches as required by plans and specifications. All safety switches shall be NEMA Heavy Duty Type HD and Underwriters' Laboratories listed. Square D Class 3110 or approved equal as manufactured by Siemens or General Electric.

B. All switches shall have switch blades which are fully visible in the OFF position with the door open. All current-carrying parts shall be plated through electrolytic processes to resist corrosion and promote cool operation.

C. All switches shall have switch blades which are visible when the switch is OFF and the cover is open.

D. The lugs shall be front removable and UL listed for 60E C or 75E C conductors (30-100 ampere) conductors (200-1200 ampere) respectively.

E. All current carrying parts shall be plated to resist corrosion.

F. The switches shall have removable arc suppressors to facilitate easy access to line side lugs.

G. The switches shall have provisions for a field installable electrical interlock.

H. The switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening action of the contacts has started.

I. The operating handle shall be an integral part of the box, not the cover.

J. Provisions for padlocking the switch in the OFF position with at least three padlocks shall be provided.

K. The handle position shall travel at least 90E between OFF and ON positions to clearly distinguish and indicate handle position.

L. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is ON and prevent turning the switch ON when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

M. The switch covers shall be attached with welded pin-type hinges.

N. The enclosure shall be finished with gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated steel (type 1), gray baked enamel paint which is electrodeposited on cleaned, phosphate pre-treated galvannealed steel (Type 3R).

O. The enclosure shall have ON and OFF markings stamped into the cover.

P. The operating handle shall be provided with a dual colored, red/black position indication.

Q. All switches shall have provisions to accept up to three 3/8 in hasp padlocks to lock the operating handle in the OFF position.

R. Tangential knockouts shall be provided to facilitate ease of conduit entry for switches rated 30-200A.

S. Enclosures for type 3R switches through 200 ampere shall have provisions for interchangeable bolt-on hubs in the top endwall. Hubs shall be Square D B-Type hubs sized as indicated on the plans.

T. Switch ratings:

1. Switches shall be horsepower rated for ac and/or dc as indicated on the plans.
2. The UL listed short circuit current rating of the switches shall be 200,000 rms symmetrical amperes with or protected by Class R or Class J fuses (30-600 ampere switches employing fuse rejection schemes).

2.16 SLEEVES, INSERTS, AND SUPPORTS

A. Furnish and install all inserts, conduit hangers, anchors and steel supports necessary for the support and installation of all electrical equipment.

B. Where openings are required in walls and floors for the passing of raceways the Contractor shall furnish the Contractor with the necessary information regarding dimensions and locations so that he may install suitable concrete stops to provide these openings. Such openings shall be by the Contractor in such a manner so as not to interfere with the fireproof integrity of the building.

C. The Contractor will be held responsible for the location of and maintaining in proper position, sleeves, inserts and anchor bolts supplied and/or set in place by him. In the event that failure to do such required cutting and patching of finished work, such work shall be done at The Contractor's expense by the Contractor.

2.17 PHOTO CELL

A. The Contractor shall furnish and install photocell lighting control equipment as indicated on the plans.

B. The photocells shall be Tork 2100 Series or equal as manufactured by Paragon or Intermatic.

C. A light level of 1.5 to 5.5 footcandles shall cause the lighting system to be activated and shall deactivate the lighting system when the light levels are approximately three times the activation level.

D. The photocell shall be provided with a two minute time delay to prevent false switching.

E. The photocell shall operate within the temperature range of -40E F and 140E (-40E C to 60E C)

F. The power consumption of the photocell shall be less than one watt.

G. The photocell enclosure shall be diecast and gasketed for weather protection.

H. The photocell shall be cadmium sulphate approximately one inch in diameter.

I. The photocell contacts shall be single pole, single throw normally closed. Photocell shall fail in the on position and shall be provided with snap action to prevent chattering.

2.18 LIGHTING CONTACTORS:

A. The Contractor shall furnish and install lighting contactors as herein described and indicated in the contactor schedule on the plans. Contactors shall be an Asco type 917 or approved equal as manufactured by Square D or General Electric.

B. 20 Ampere rating Asco 917

1. The remote control switch shall be electrically operated by a dual-acting, single-solenoid mechanism that is inherently interlocked and mechanically held in both the open and closed positions. The main contact shall be power driven in both directions. Positive locking of contact positions shall not be dependent on gravity, hooks, latches or semi-permanent magnets.
2. The remote control switch shall be capable of operating in any position. Provisions shall be incorporated for manual operation during inspection and maintenance.

3. The remote control switch shall be Underwriters' Laboratories listed under U 508. Main contacts shall be double-break, continuous-duty rated 20 amperes to 600 volts, AC, 60 Hz (30 amperes to 600 volts ACm 60 Hz, for general-purpose loads), and be marked for ballast lighting (electric discharge lamps), tungsten and general-purpose loads. Lighting contactors requiring derating when used in an enclosure or with tungsten lamp loads shall not be acceptable.
4. The remote control switches shall be provided with clamp-type, self-rising terminal plates for solderless connection of line, load an control conductors. Terminals shall accept a wide range of #18 AWG to #10 AWG CU.
5. The number of poles, up to a maximum of 12, on a single remote control lighting contactor shall be provided as indicated on the plans.
6. The remote control switches shall be U listed for the following short-circuit withstand current ratings when coordinated with a U-listed molded case circuit breaker rated 30 amperes:

   22,000 amps rms symmetrical, 250 volts, 60 Hz

7. The operating coil and main contacts shall be replaceable from the front without major disassembly and visual indication shall be provided for each contact.
8. Provisions shall be included to permit remote pilot lamp-type visual indications without the necessity for auxiliary contacts or additional wiring.
9. Each remote control switch shall be furnished with an owner's manual providing installation and operation instruction.
10. Provide accessory No. 48 three wire control interface module. Interface module shall allow the building solid state energy management system to control contactors.
11. Each remote control switch shall be provided with a hand-off-automatic switch to allow maintenance on the building exterior lighting system.

2.19 FIRE PROOF SEAL MATERIAL:

A. Fire Stop Foam:

1. The fire stopping sealant shall be a one-part, neutral curing silicone sealant. The sealant shall be completely water resistant and shall contain no solvents nor inorganic fibers of any kind. The through-penetration firestop sealant shall allow movement of +25% and shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479). The firestop joint sealant shall allow movement up to + 50% and shall be UL Classified and tested to the requirements of UL2079.

B. Firestop Mortar:

1. The fire stopping material shall be a light-weight, fast drying Portland cement based material. The density of the wet mortar shall be < 45 lb./cu.ft. The specified mortar shall be approved for a wide range of applications including combustible and non-combustible penetrants when used by itself or in combination with other products from the same manufacturer. The firestop mortar shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479).

2.20 TERMINAL CABINETS:

A. The Contractor shall furnish and install terminal cabinets as indicated on the plans.

B. Terminal connecting cabinets and hinged trims shall be galvanized steel, complete with 3/4 inch thick soft plywood backboard, having two (2) coats of insulating finish, terminal blocks and identification of all systems and wiring.

C. Terminal connecting cabinets shall match panelboard cabinets in style and color and be of the same manufacturer. Cabinets shall be sized as indicated on the Drawings.

D. Provide a cardholder framed under plastic on the inside of the door, indicating the cabinet number and system designation.

E. Terminal connecting cabinets shall have barrier type terminal blocks with number of terminal blocks as required to strip and make-up connections of all conductor entering and leaving the cabinet. Conductor splices shall not be made in cabinets. Cabinets for telephone company use will not require terminal blocks included under this contract.

F. All wiring in cabinets shall be properly grouped, bound and tied together in a neat and orderly manner by use of plastic cable ties.

G. Where terminal strip cabinets form a part of an empty conduit system for future wiring the terminal blocks may be omitted.

2.21 FUSES:

A. Fuses shall be non-renewable type, Chase-Shawmut "Amp-Trap" or equal, U.L., Inc. Class J up to 600 amperes and Class L over 600 amperes. Fuses shall be current-limiting type.

B. Class J and Class L fuses shall be 600 volts or less A.C., shall be listed by Underwriters' Laboratories, Inc., and shall have a minimum interrupting rating of 200,000 r.m.s. amperes with peak let-through current and maximum clearing values within the prescribed limits of U.L. and be so marked. Fuses for motor feeders or motor circuits shall be Class K-5, of a voltage classification rated for the motor, with a minimum interrupting capacity of 100,000 r.m.s. amperes and with time delay of a minimum of 10 seconds at 500 percent.

2.22 FLUORESCENT BALLASTS:

A. All fluorescent ballasts shall be of the high-power factor, energy saving type and their design and construction shall conform to the CBM standards certified by ETL, and the National Electrical Code.

B. The ballast fill material shall be of thermo-setting type and shall not soften under failure. The ballasts shall be equipped with an internal automatic resetting thermal protector adjacent to the coils. The ballast case temperature shall not exceed 90 degrees in continuous operation.

C. The Contractor shall submit a separate cost to upgrade all fluorescent ballast from energy saving magnetic ballast to electronic ballast.

2.23 FIRE ALARM SYSTEM: TO BE REWORKED

A. The Contractor shall furnish, install and wire addressable fire alarm devices for building as indicated on the drawings and as herein described. The fire alarm devices and installation shall comply with the current applicable provisions of the following standards.

B. The fire alarm control panel is existing in place. The existing fire alarm control panel is an addressable fire control panel manufactured by Fire Control Instruments model 7200. The Contractor shall be responsible for the installation of branch circuit to serve the existing fire alarm control panels.

1. NFPA 70 Massachusetts Electrical Code
2. NFPA 71 Central Station Signaling Systems-Protected Premises Unit.
3. NFPA 72 Massachusetts Fire Alarm Code
4. State building codes.
5. All requirements of the Local Authority Having Jurisdiction.
6. Underwriters Laboratories, Inc.

C. The system and all components shall be listed by Underwriters Laboratories, Inc. for use in Fire Protective Signaling Systems under the following standards as applicable:

1. UL864 Control Units for Fire Protective Signaling Systems.
2. UL268 Smoke Detectors for Fire Protective Signaling Systems.
3. UL 217 Smoke Detectors, Single and Multiple Station.
4. UL 521 Heat Detectors for Fire Protective Signaling Systems.
5. UL 464 Audible Signaling Appliances.
6. UL 1638 Visual Signaling Appliances.
7. UL 38 Manually Actuated Signaling Boxes.
8. UL 1481 Power supplies for Fire Protective Signaling Systems.
9. Town of Bedford Fire Alarm Regulations.

D. General Requirements

1. Submittals
   b. The Contractor shall submit complete documentation for the Fire Alarm/Life Safety System showing the Model Number, type, rating, size, style, Manufacturer's Names, and Manufacturer's Catalog Data Sheets for all items to ensure compliance with these specifications.

c. Upon Contract Bid approval, and prior to the start of system installation, the Contractor shall submit a complete riser diagram and layout of the entire Fire Alarm/Life Safety System, showing all interconnect wiring and equipment. The riser diagram shall be project specific with actual wiring indicated for fire alarm equipment to be utilized on this project. General wiring diagrams shall not be considered for approval.

d. The fire alarm devices herein described are that of Notifier.

2. Fire Alarm Device Manufacturers

a. All references to manufacturer's or supplier's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality.

3. General Equipment and Material Requirements

a. All fire alarm system components shall be supplied by a factory authorized Notifier affiliate. All material shall be new and unused and listed by Underwriters' Laboratories for the specific intended purpose. All fire alarm system peripherals shall be designed for continuous duty without degradation of function or performance. All fire alarm system peripherals covered by this specification or noted on Installation Drawings shall be the best fire alarm system peripherals suited for the application and shall be provided by a single manufacturer.

b. The systems will permit maximum system expansion and owner flexibility with a minimum of additional field wiring. The system shall be wired, connected, tested, and left in first class operating condition.

c. The systems are solid state, microprocessor based, to ensure reliable operation, low maintenance costs, and long life.

d. The fire alarm system peripherals and completed installation shall meet the approval of the Town of Bedford Fire Department, the Authorities having jurisdiction, and in accordance with applicable sections of the latest edition of NFPA 72 for Auxiliary Fire Alarm Systems, and Massachusetts Fire Codes.

e. All fire alarm control panels are predominately red in color and the Contractor shall install a white label with the words FIRE ALARM CONTROL PANEL on the front of each existing fire alarm panel with a minimum four (4) inch letter size. No other functions shall be allowed in the panel (i.e. security system).

f. All fire alarm system peripheral devices shall be listed by Underwriters Laboratories.

g. Approved Equipment Suppliers

1) The fire alarm peripheral devices shall be as manufactured by Notifier. Equipment designations and model numbers herein specified are those of Notifier. It will be the responsibility of the Engineered System Distributor to ensure proper specification adherence for system operation, final connection, test, turnover, warranty

compliance, and after-market service. The distributor of the equipment specified shall be factory trained and certified.

2) All equipment shall be provided by one manufacturer. Notifier.

E. System Operation

1. The system provides a means to detect fire conditions within a protected property, transmit the alarm to the Town of Bedford Fire Department, alert building occupants in which the alarm occurred with the use of a new fire alarm system communicator, to supervise each system for conditions which would impair proper system operation and to annunciate such abnormal conditions.
2. Except as permitted by the Fire Marshal, the operation of any alarm-initiating device shall cause the evacuation alarm to sound and be displayed on all evacuation signaling devices in each respective building area connected to the system as well as illuminate a fire alarm annunciator at each building address.
3. System is designed to sound/display evacuation signals only in designated areas shall be provided with means to sound/display the evacuation signal on all connected devices. This means shall be provided at the control panel.
4. Audible/Visual devices shall be horns listed for fire alarm service except as otherwise permitted.
5. Visual signaling devices shall be approved for the purpose and shall operate only in those areas where the evacuation signaling is required to be sounded and shall have the word "FIRE" permanently inscribed on their surfaces.
6. The system shall be electrically/electronically supervised against component failure of the entire audio path including wiring, switches and electrical contacts and shall detect opens, shorts, grounds or loss of signal, which might impair the function of the system.

F. Building Fire Alarm Control Panel:

1. The building Fire Alarm Control Panel is existing and is a Fire Control Instruments model 7200. (Addressable panel). and contains a microprocessor based Central Processing Unit (CPU). The CPU communicates with and control the following types of equipment used to make up the system: addressable detectors, addressable modules, printer, annunciators, and other system controlled devices.
2. System Capacity and General Operation
   a. The Building Fire alarm control panel provides 139 addressable devices.
   b. The Fire Alarm Control Panel includes a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the Field Programming and Control of the Fire Alarm System.

c. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the Fire Alarm Control Panel.

d. Fire Alarm Control Panel provides the following features:
   1) Drift Compensation to extend detector accuracy over life.
   2) Sensitivity Test, meeting requirements of NFPA 72.
   3) Maintenance Alerts to warn of excessive compensation.
   4) System Status Reports to display or printer.
   5) Alarm Verification, with verification counters.
   6) PAS pre-signal, meeting NFPA 72 requirements.
   7) Rapid manual station reporting (less than 2 seconds).
   8) Non-Alarm points for general (non-fire) control.
   9) Periodic Detector Test, conducted automatically by software.
   10) Pre-alarm for advanced fire warning.
   11) Counting "cross-zone" options.
   12) Temporal coding.
   13) Walk Test, with check for two detectors set to same address.
   14) Control-By-Time for non-fire operations, with holidays.
   15) Day/Night automatic adjustment of detector sensitivity.
   16) Device Blink Control for sleeping areas.

e. Central Microprocessor
   1) The Microprocessor unit of the fire alarm control panel communicates with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage; non-volatile memory for building-specific program storage; and a "watch dog" timer circuit to detect and report microprocessor failure.
   2) The Microprocessor unit of the fire alarm control panel contains and executes all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, and shall not be lost even if system primary and secondary power failure occurs.
   3) The Microprocessor Unit of the fire alarm control panel also provides a Real-Time Clock for time annotation of system displays, printer, and history file. The Time-of-Day and date shall not be lost if system primary and secondary power supplies fail. The Real Time Clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

f. Display
   1) The Display of the fire alarm control panel provides all the controls and indicators used by the system operator and

may also be used to program all system operational parameters.

2) The Display of the fire alarm control panel includes status information and custom alphanumeric labels for all Intelligent Detectors, Addressable Modules, and Software zones.

3) The Display of the fire alarm control panel provides an 80-character backlit alphanumeric Liquid Crystal Display (LCD). It also provides 8 Light-Emitting-Diodes (LEDs) that will indicate the status of the following system parameters: POWER, FIRE ALARM, PRE-ALARM, SECURITY, SUPERVISORY, SYSTEM TROUBLE, SIGNALS SILENCED and POINT DISABLED.

4) The Display of the fire alarm control panel provides a full QWERTY key touch pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.

5) The Display of the fire alarm control panel includes the following operator functions: SIGNAL SILENCE, RESET, DRILL, ACKNOWLEDGE and LAMP TEST.

G. System Functional Operation

1. System Alarm Detection and Reporting.

a. When a fire alarm condition is detected by the building fire alarm control panel and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

1) The System Alarm LED flashes.

2) A local Piezo-Electric signal in the control panel sounds.

3) The 80-character LCD display shall indicate all information associated with the Fire Alarm condition, including: type of alarm point, its location within the protected premises, and the time and date of that activation.

4) All system output programs assigned via control-by-event equations are activated by the particular point in alarm shall be executed, and the associated System Outputs (Alarm Indicating Appliances and/or relays) shall be activated.

5) Unacknowledged alarm messages have priority over trouble messages, and if such an Alarm occurs during a Trouble sequence, the Alarm condition will have display priority.

6) Sound fire alarm audio/visual signals in dwelling units and common space at the address of incidence if incidence occurred at the first or second floor of this address.

7) Sound fire alarm audio/visual signals in dwelling units, and common space at addresses encompassed by the basement space, but in no case shall more than two (2) building address sound alarm
8) Summons the Town of Bedford Fire Department through the site municipal fire alarm digitize panel.
9) Turn on exterior strobe light of the building in which the alarm occurred.

2. System Trouble Detection.
   a. When a trouble condition is detected and reported by one of the system initiating devices, the following functions immediately occurs:

      1) The System Trouble LED flashes.
      2) A local Piezo electric signal in the control panel sounds.
      3) The 80-character LCD display indicates all information associated with the Fire Alarm trouble condition, including: type of trouble point, its location within the protected premises, and the time and date of that activation.
      4) If any of the available optional serially connected equipment is being used, then the of the connected peripherals will display/print the information associated with the Fire Alarm Control Panel condition, including the time/date stamping of the change of status event.
      5) If applicable, all system output programs assigned via control-by-event equations to be activated by the particular point in trouble shall be executed, and the associated System Outputs (Trouble Indicating Appliances and/or relays) shall be activated.
      6) Notify the central station provider who, in turn, shall notify the Owner of the fire alarm system trouble condition.
      7) Unacknowledged alarm messages shall have priority over trouble messages, and if such an Alarm occurs during a Trouble sequence, the Alarm condition will have display priority.

3. System Common Control Switch Operation.
   a. Acknowledge (ACK/STEP) Switch.
      1) Activation of the control panel Acknowledge switch in response to a single new Alarm and/or Trouble condition silences the local panel piezo electric signal and changes the System Alarm or Trouble LED from flashing mode to steady-ON mode. If additional new Alarm or Trouble conditions exist or are detected and reported in the system, depression of this switch shall advance the 80-character LCD display to the next Alarm or Trouble condition.

2) In this case, the local piezo sounder shall not silence, and the Alarm/Trouble LEDs shall not transfer to their steady-on mode, thus signaling to the operator that more Alarm/Trouble conditions are present in the system.
3) Alarm conditions always have display priority before Trouble conditions. Depression of the Acknowledge switch shall cause a corresponding (time-stamped) message to be displayed on all system peripheral equipment (if used).
4) Occurrence of any new Alarm or Trouble conditions in the system shall cause the Control Panel to resound the Local Piezo sounder and repeat the Alarm or Trouble sequences.

b. Signal Silence Switch.
1) Activation of the Signal Silence Switch causes all programmed Alarm Indicating Appliances and relays to return to the normal condition after an alarm condition. The selection of indicating circuits and relays, which are silenceable by this switch, shall be fully field programmable within the confines of all applicable standards.

c. System Reset Switch.
1) Activation of the System Reset Switch causes all electronically latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
2) If the alarm conditions still exist, or if they re-occur in the system after System Reset Switch activation, the system resound the alarm conditions.

d. Alarm Verification
1) The Fire Alarm Control Panel provides Alarm Verification per point with tally. The of the Intelligent/Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification Function is from 0-60 seconds and the detector shall be able to be enabled/disabled during the field programming of the system, or anytime after system turn-on. The Alarm Verification does not require any additional hardware to be added to the Fire Alarm Control Panel.

e. System Reports.
1) The system is able to generate and print a summary of all of the Detectors, Modules, Pull Stations, and Zones, which are currently active in the System. This printout will require password protection to prevent unauthorized user access, and will automatically print the system report using "soft" (single push) keys. No computer expertise will be required to initiate the System Report sequence.

f. Signal Silence Inhibit Time

1) The Fire Alarm System is equipped with a Signal Silence Inhibit feature, which will prevent the operator from silencing any of the signals for a period of seconds. (0-300 seconds). The function of this Signal Silence Inhibit Timer shall be field programmable and its limit shall be field definable, without the need for the installation of any hardware modules into the system.

g. Automatic Signal Cutout Time

1) The Fire Alarm System is equipped with an Automatic Signal Silence Cut-Out feature which will automatically silence all of the signals after a period of seconds. (000 none; 600 to 900 seconds). The function of this Automatic Signal Silence Cut-Out Timer is field programmable and its limit shall be field definable, without the need for the installation of any hardware modules into the system.

h. System Point Operations

1) Device Disable

a) Any Device in the system may be Enabled or Disabled through the system keypad without the need to reprogram or deprogram any of the operational parameters of the point such as Control-By-Event linkages, etc.

2) Output Point Control

a) Any system output point may be turned on or off from the system keypad.

3) Point Read

a) The system is able to perform a point status diagnostic function without the need for peripheral equipment to make the readings. The point will provide the following parameters:

(1) Device Status
(2) Device Type
(3) Custom Device Label (32 character extended)
(4) Zone CBE Selection
(5) Current Alarm Reading (percent)
(6) Alarm Sensitivity Level
(7) Pre-Alarm Sensitivity Level
(8) Cooperative Multi-Detector selection
(9) Alarm Verification
(10) Device SLC Address
(11) Switch Inhibit (on/off)
(12) Silenceable/Non-silenceable
(13) Walk Test

4) Point Status Report

a) Upon command from a password-authorized operator of the system, a report can be generated which details the and every installed detector,

module, zone, and annunciator, as well as any and all field programmed parameters which have been assigned to these points and (optionally) printed.

5) System History Recording and Reporting
   a) The Fire Alarm Control Panel contains a History Buffer, which will be capable of storing up to 800 system output/input/control activations plus a separate 200 event alarm-only file. The of these activations will be stored and time and date stamped with the actual time of the activation, until a password authorized operator requests that the contents be either displayed, or printed. The contents of the History Buffer may be manually reviewed; one event at a time, and the actual number of activations may also be displayed and or printed. History Buffer Reports (whether Displayed or Printed), will be instantly distinguishable from all other displayed or printed system reports through the use of a semicolon in the time/date stamp of the data.
6) Automatic Detector Maintenance Alert
   a) The Fire Alarm Control Panel automatically interrogates each Intelligent System Detector and shall analyze the detector responses over a period of time. The Fire Alarm Control Panel provides three levels of Maintenance Alert.
      (1) Low Chamber Value. This warning shall indicate that there is a hardware problem in the detector.
      (2) Maintenance Alert. This warning shall indicate that the dust accumulation is near but below the allowed level and that the detector needs maintenance before the detector performance is compromised.
      (3) Maintenance Urgent. This warning shall indicate that the dust accumulation is above the allowed limit.

H. Monitor Module

1. Monitor modules shall be provided to connect one supervised IDC zone of conventional Alarm Initiating Devices (any N.O.) dry contact device, including 4-wire smoke detectors, manual pull stations, waterflow devices and supervisory devices), to one of the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops. The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box, to a surface mounted back box, or directly into the Fire Alarm Control Panel.

2. The IDC zone may be wired for Style D or Style B operation. The Monitor module shall provide address-setting means using rotary decimal switches and shall also store an internal identifying code, which the Fire Alarm Control Panel shall use to identify the type of device. An LED shall be provided which shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.

I. Control Module

1. Control Modules shall be provided to supervise and control the operation of one conventional Indicating Appliance Circuit (IAC) of compatible, 24 VDC powered, polarized Audio/Visual Indicating Appliances. The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox, or directly in the Fire Alarm Control Panel.
2. The IAC may be wired for Style Z or Style Y IAC (Up to 48 Watts of Audio Speaker or 1 Amp of Inductive A/V Signal, or 2 Amps of Resistive A/V Signal) operation.
3. Audio/Visual or Speaker Power shall be provided by a separate supervised Power Loop from the main Fire Alarm Control Panel or from a supervised, U.L. Listed Remote Power Supply or Audio Amplifier.
4. The Control Module shall provide address-setting means using rotary decimal switches and shall also store an internal identifying code, which the Control Panel shall use to identify the type of device. An LED shall be provided which shall flash under normal conditions, indicating that the Control Module is operational and is in regular communication with the Control Panel.

J. Relay Modules

1. The addressable relay module shall provide the system with a dry-contact output for activating a variety of auxiliary devices, such as fans, dampers, control equipment, etc. Addressability allows the dry contact to be activated, either manually or through panel programming. The Relay Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box, or to a surface mounted backbox, or directly in the Fire Alarm Control Panel.

K. Isolator Module

1. Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. If a wire-to-wire short occurs, the Isolator Module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically re-connect the isolated section of the SLC loop. The Isolator Module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator

Module after its normal operation. The Isolator Module shall mount in a standard 4-inch deep electrical box, in a surface mounted backbox, or in the Fire Alarm Control Panel. It shall provide a single LED, which shall flash, to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

L. Addressable Manual Stations

1. Addressable Manual Stations shall be provided to connect one addressable, supervised Manual Station to one of the Fire Alarm Control Panel Signaling Line Circuit (SLC) Loops.
2. The Manual Station shall, on command from the Control Panel, send data to the panel representing the state of the manual switch. Manual Fire Alarm Stations shall be crush tube (or non-crush tube) type with a key operated test-reset lock, and shall be designed so that after actual Emergency Operation, they cannot be restored to normal use except by the use of a key. All operated stations shall have a positive, visual indication of operation and shall clearly show the word AACTIVATED@ upon activation. Manual Stations shall be constructed of LEXAN with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger. Stations shall be suitable for surface mounting on matching backbox, or semi-flush mounting on a standard single gang box, and shall be installed within the limits defined by the American with Disabilities Act (ADA). The Manual Station shall provide address-setting means using rotary decimal switches and shall also store an internal identifying code, which the control panel shall use to identify the type of device. An LED shall be provided which shall flash under normal conditions, indicating that the Manual Station is operational and in regular communication with the control panel. The LED may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. The station shall provide a key reset. The key shall be the same as used for the fire control panel.

M. Intelligent and Addressable Photoelectric Smoke Detectors

1. The Intelligent Photoelectric Detectors shall be Intelligent and Addressable, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. The detectors shall use the photoelectric principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. The detectors shall be ceiling-mount and shall include a twist-lock base. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself, by activating a magnetic switch, or may be activated remotely on command from the control panel. The detectors shall provide address-setting means on the detector head using

rotary decimal switches. Because of the possibility of installation error, systems that use binary jumpers or dipswitches to set the address are not acceptable. The detectors shall also store an internal identifying code, which the control panel shall use to identify the type of detector.

3. The detectors shall provide dual alarm and power LEDs providing 360 degree viewing angle. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be controlled through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED. Detectors that do not provide a 360-degree viewing angle will not be acceptable.
4. The detector sensitivity shall be set through the Fire Alarm Control Panel, and shall be adjustable in the field through the field programming of the system. There shall be 9 levels of alarm sensitivity and 9 levels of pre-alarm sensitivity to choose from.
5. The detector shall also have the ability to be set for ASelf-Optimizing@ that will allow the detector to set itself to the best suited sensitivity.
6. The detector shall display its address, at the detector, during AWalk Test@.

N. Intelligent Heat Detectors

1. The Intelligent Heat Detectors shall be Intelligent and Addressable devices, and shall connect with two wires to one of the Fire Alarm Control Panel Signaling Line circuits.
2. The detectors shall use an electronic sensor to measure thermal condition caused by a fire and shall, on command from the control panel, send data to the panel representing the analog level of such thermal measurements. The heat detector shall provide a Fixed 135 degree detection as indicated on the drawings.
3. The detectors shall be ceiling-mount and shall include a twist-lock base.
4. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
5. The detectors shall provide address-setting means on the detector head using a decimal switch. Because of the possibility of installation error, systems that use binary jumpers or dipswitches to set the address are not acceptable.
6. The detectors shall provide dual alarm and power LEDs providing 360 degree viewing angle. Both LEDs shall flash under normal conditions. In certain applications, LEDs may be selected to be polled without flashing through system programming. Both LEDs may be placed into steady illumination by the control panel, indicating that an alarm condition has been detected.

7. An output connection shall also be provided in the base to connect an external remote alarm LED.
8. The heat detector shall display its address, at the detector, during AWalk Test@.

O. ADA High Intensity Strobe Audio-Visual Alarm Indicating Appliances

1. High Intensity Strobe Audio-Visual Alarm Indicating Appliances shall be listed with Underwriters Laboratories for use with Fire Protective Signaling Systems. Horn/strobes shall have a minimum sound output of 96dB @ 10 feet and shall be flush mounted. The horn shall sound in a Temporal pattern. The strobe shall have a candela rating that meets or exceeds the requirements of the Americans with Disabilities Act (ADA) and shall be of such rating as shown on the drawings. The device shall be rated at 24 VDC nominally and have an acceptable operating range of 20-30 VDC.
2. The device shall mount to a 4" square by 1-1/2@ back box located in common spaces, basement spaces, basement spaces and dwelling units.

P. ADA High Intensity Strobe Only Unit

1. High Intensity Strobe Only Unit shall be listed with Underwriters Laboratories for use with Fire Protective Signaling Systems and accepted by the local Authority Having Jurisdiction. The strobe shall meet or exceed the requirements of the Americans with Disabilities Act (ADA) and shall be of such rating as shown on the drawings. The device shall be rated at 24 vdc and shall have a flash rate of 1 HZ.
2. All strobes shall have the ability to be synchronized.

Q. High Intensity Exterior Strobe Light

1. The exterior strobe light shall be listed with Underwriters Laboratories and accepted by the local Authority Having Jurisdiction. It shall have a minimum output of 150,000-candle power. It shall operate on 24 vdc and have a red high impact resistant polycarbonate lens. The exterior strobe shall also be of weather-resistant rain tight construction.

Model Number: DC MAX R Manufacturer: Wheelock

R. Fire Alarm/Life Safety System Installation

1. Provide and install the system in accordance with the plans and specifications, all applicable codes, and manufacturers' recommendations. All wiring shall be installed in strict compliance with all the provisions of NEC -Article 760 A and C, Power Limited Fire Protective Signaling Circuits or if required may be reclassified as non-power limited and wired in accordance with NEC-Article 760 A and B. Upon completion, the contractor shall so certify in writing to the owner and Contractor.
2. Removal of a smoke detector will not interfere with the transmission of signal from manual stations, waterflow switches, and other initiating devices.

3. All Equipment shall be attached to a non load-bearing wall, and shall be held firmly in place. Fastening and supports shall be adequate to support the required load, and provide a safety factor of five.
4. As indicated on the Riser/Connection diagram drawings, each system alarm point or zone in the system shall be uniquely labeled within the Fire Alarm Control Panel. Names of the system designators shall be as defined by the Town of Bedford Fire Department.
5. Fire Alarm Control Panel will be mounted with the center of panel 60 inches above floor level.
6. All junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color codes shall be maintained throughout the installation.
7. Cable and Wiring.
   a. Conduit and Conductors: Provide complete wiring and conduit between all equipment. Unless otherwise specified within the Installation Manual of the specific equipment being used, all field wiring shall be #14 Type in separate conduit, maximum 40% full, and shall be approved for use as Fire Alarm cable. Conduits of proper size shall be installed from the Control Panel; Equipment to field devices. All field devices shall be mounted upon U.L. Listed Electrical junction boxes. All splices in field wiring shall be made in U.L. Listed Electrical junction boxes. All Electrical junction boxes shall be labeled as "Fire Alarm System" with decal or other approved markings. The Fire Alarm/Life Safety Installation shall comply fully with all Local, State and Massachusetts Codes, and the Local Authority Having Jurisdiction (AHJ).
   b. The Fire Alarm Control Panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire Alarm Control Panel Primary Power wiring shall be 12 AWG. The Control Panel Cabinet shall be grounded securely to either a cold water pipe or grounding rod. Conduit shall enter into the Fire Alarm Control Panel backbox only at those areas of the backbox, which have factory conduit knockouts.
   c. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; an audible and visual trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
   d. Open cable shall be allowed above ceilings, in attics and in other areas allowing surface wiring if so approved by the Local Authority Having Jurisdiction.
   e. Cable shall be the type listed for Fire Alarm/Life Safety use and shall be installed per NEC Article 760.
   f. Cable for Addressable/Intelligent Alarm Initiating Appliances (Manual Stations, Heat Detectors, Smoke Detectors, etc.) shall be connected as shown on the riser diagram. Cable shall be installed from the Fire Alarm Control Panel to all devices in that Signaling Line Circuit (SLC) loop. The connection and continuity of the

wires, which make up that SLC loop will be continuously supervised for shorts, opens, and ground circuit conditions.

g. Cable for Alarm Initiating Devices and Appliances (Manual Stations, Heat Detectors, Smoke Detectors, etc.) shall be connected to the Fire Alarm Control Panel, and labeled as shown on the riser diagram. Cable shall be installed from the Fire Alarm Control Panel to all devices in that Initiating Device Circuit (IDC) loop. The connection of the cable to that loop will be continuously supervised for shorts, opens, and ground circuit conditions.

h. Cable for Alarm Indicating Appliances (Audible or Visual or combination signal(s)) shall be connected on a per zone basis. Cable shall be installed from the Fire Alarm Control Panel to all devices in that Indicating Appliance Circuit (IAC) loop. The connection of the cable to that loop will be continuously supervised for shorts, opens, and ground circuit conditions.

i. Cable must be separated from any open conductors of Power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, as per NEC Article 760-29.

j. All exposed cable below 84 inches from the surface of the finished floor, or other locations where the cable may become exposed and/or damaged, must be within a steel conduit.

k. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or back boxes, except where conduit entry knockouts have been provided by the factory.

l. Cable shall meet all the manufacturer's requirements including shielding, twists, capacitance, resistance and gauge. The cable shall not be installed without approval of the manufacturer in writing.

s. Final System Acceptance.

1. The system will be accepted only after a Factory-Trained Distributor in the presence of the Contractor, the owner=s representative and the Local Fire Marshal have accomplished a satisfactory test of the entire system, in accordance with NFPA 72. Upon completion of a successful test, the Contractor shall so certify in writing to the Owner. The Contractor shall pay all back charges assessed by the Town of Bedford Fire Department for all fire alarm system tests.
2. The Contractor shall submit, in the shop drawings, a letter confirming that they will provide a U.L. listed testing company as required by the Fire Department, to provide the acceptance test.
3. The Contractor shall submit, in the shop drawings, a letter from the fire alarm equipment manufacture stating that all the equipment manufactured by them carries a (3) three-year manufacturer=s warranty.

4. The Contractor will present a complete set of "as- built" Fire Alarm/Life Safety system drawings, and the factory supplied Operator's Manual to the Building Owner's Representative and the local AHJ.
5. The Contractor shall provide the on-site services of an Authorized, Factory Trained technical representative to supervise all connections and fully test all devices and components of the system during installation phase.
6. The Contractor shall provide comprehensive Training on the operation, proper use, and testing of the installed Fire Alarm System to the Building Owner's Representative, and the local AHJ.

T. Warranty

1. The Contractor shall warrant the completed fire alarm system, wiring and equipment, to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of the first beneficial use.

2.25 CABLE TELEVISION DISTRIBUTION SYSTEM

A. This Contractor shall furnish and install the cable television, modify the existing cable television distribution system as required to accommodate the additional television outlets as indicated on the plans.

B. It is intended that this Contractor shall install all CATV distribution system cables and outlets. Outlets and cables shall be furnished by the television system supplier and installed by the Electrical Contractor.

C. Soft iron pull wires shall be left in all empty CATV distribution system conduits for use by the owner.

D. Construction Details:

1. Belden 1829A RA6 cable shall be used to prewire television outlets in dwelling units.
2. The longest drop shall not exceed 150'.
3. The longest drops will be home run from dwelling unit closet to electric room as indicated on the plans.
4. All drops will be tagged with the apartment number at the lockbox location.
5. Do not kink, form tight (90E) ninety degree angles, pieces the plastic jacket, damage or mishandle the cable in any way.
6. Do not use staples, nails, tacks, etc. to secure the drop cables. Roka or Hiat cable clips or tywraps will be provided upon request.
7. Leave eight (8) inch tails in the television system outlet box. Leave six (6) foot tails at the lockbox location.
8. Proper clearance from heating or hot water pipes is to be maintained.
9. Cable TV finished wall plates will be installed by the Electrical Contractor.
10. Upon completion of the pre-wiring and final inspection by COMCAST, active plant will be brought to the building and spliced into servicing equipment.

11. COMCAST must be given timely notice if system (hard line) must be brought into the building prior to the completion of the finish work.
12. At least three inch (3") PVC conduit is to be used for all underground feeds. Timely notice must be given so that correct size can be determined.
13. Any conduit is to be buried at a depth no less than eighteen inches (18").
14. No ninety degree (90E) sweeps or bends in conduit are permissible. The most acute angle acceptable is forty-five (45E) degrees.
15. Nylon pull lines are to be provided for future use. The conduit is to be capped at either end. Any damaged or poorly installed conduit will be the responsibility of the owner/contractor.

2.26 CLOCK AND PROGRAM SYSTEM

A. The Electrical Contractor shall modify the existing clock system as required to support the additional clock outlets as indicated on the plans. The Electrical Contractor shall furnish and install a Synchronous Wired Time System with hourly and twelve hour individual correction according to the following specifications, to be wired, connected and left in first-class operating condition. All equipment shall be approved by the Underwriters' Laboratories, as manufactured by Simplex Time Recorder or approved equal.

B. Furnish and install a Electronically Regulated Master Time Control Center. The regulated accuracy of the Master Control shall be two seconds per month, or less. This regulation shall not be dependent of the frequency of the power source, but shall be a built-in characteristic of the Master Control Center utilizing a solid crystal oscillator. During and overall power failure, the Master Control Center shall operate for a minimum of twenty-four (24) hours.

C. The Master Time Control shall maintain the same close accuracy whether running from alternating current or operating on standby power. The Master Time Center shall employ a mode of solid stated switching circuits for the second, minute, hourly and twelve hours correction of all secondary clocks and the program control unit. All dynamic assemblies within the Master Time Control Center shall be pluggable and interchangeable to provide flexibility and ease of handling. This control shall provide for the automatic correction, when necessary, of any individual clock for fifty-five seconds fast time and fifty-nine minutes slow time in any one hour period. Twice daily entire system is corrected up to twelve hours of slow time in the event general outage is more than one hour.

D. The Time Control Center (TCC) shall be microprocessor-based solid state and shall provide accurate timekeeping for control of synchronous secondary clocks. The TCC shall have user programmable time and day of week referenced control of output control circuits.

E. A LCD display shall be used to show the time, day of week, and status of the output circuits without having to scroll through programming schedules, and is also used for programming, editing and viewing of stored programs.

F. The state of the output circuits are to be programmed by the used through a keypad or may also be controlled by manual override switches, one per circuit, which allow the user to turn the output circuits on, off, or to automatic control.

G. The user shall be able to program from one to four independent schedules within the TCC; changing between schedules will be accomplished through the keypad and may be done at any time.

H. The TCC shall have seconds programming resolution for the output circuits when using on/off type program commands. Additional programming notes available include pulse, delay, delay/pulse as well as coded and dual coded relay control.

I. The TCC shall be powered form 120VAC 60 HZ, however, during a power failure it will retain its program and continue time keeping for up to 168 hours (7 days). (Time keeping accuracy can be selected to be based either on AC power line frequency or a DC quartz crystal oscillator.) (Time keeping accuracy shall be a high accuracy. + or - 3 seconds per month, temperature compensated crystal oscillator.)

J. The Time Control Center is synchronized to Coordinated Universal Time (WWV/WWVH) via an interface. The interface will scan all 5 frequencies (2.5, 5, 10, 15 and 20 MHz) and select the strongest and clearest signal. Information on hours, minutes and seconds (adjusted for Time Zone and Daylight Savings Time) will be provided to the Time Control Center via an interface to insure synchronization.

K. The TCC shall be 19" (ELA) rack mounted in sound system rack supplied under sound system.

L. Classroom Clocks shall be 12" round surface mounted. They shall be single synchronous motor operated, individually corrective with aluminum cases, convex protection glass, white dials and black modern hour and minute hands. The case shall be Matte black. All clocks shall be equipped with a special polarized receptacle. Backboxes shall be furnished for new construction and adapters for existing locations.

M. The system shall be wired with #14 THW in existing conduits or EMT conduit, throughout, color codes, red, white and black to all clocks in accordance with the manufacturer's diagrams.

N. The manufacturer shall furnish gratis to the Owner, a one-year contract effective from date of installation for maintenance and inspection service of the manufacturer's equipment with a minimum of two inspections during the contract year.

O. It shall be the responsibility of the Contractor to furnish power supplies of sufficient capacity to meet the needs of the entire system.

P. All wiring for clocks shall be to the requirements of the clock supplier.

PART 3 - EXECUTION

3.1 DRAWINGS

A. The drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, ducts, conduits and fixtures. The locations of all items shown on the drawings or called for in the Specifications that are not definitely fixed by dimensions, are approximate only. The exact location necessary to secure the best conditions and results must be determined at the project and shall have the approval of the Engineer before being installed. The Contractor shall follow drawings in laying out work and checking drawings of other trades to verify spaces in laying out work to be installed.

B. Maintain maximum headroom and space conditions are all points. Where headroom or space conditions appear inadequate, Engineer shall be notified before proceeding with the installation. If directed by the Engineer, 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. The Engineer shall be the sole judge of what a "reasonable modification" in the layout is.

3.2 WORKMANSHIP

A. The entire work provided in this Specification shall be constructed and finished in every respect in a workmanlike and substantial manner. It is not intended that the drawings shall show every pipe, fitting and appliance, but Contractor shall furnish and install all such parts as may be necessary to complete the systems in accordance with the best trade practice and satisfaction of the Engineer.

3.3 INSTALLATION OF WIRING AND CONDUIT

A. In general, all conduits shall be run concealed unless otherwise indicated to be run exposed.

B. Exposed conduits shall be run parallel to, or at right angles to, the walls of the building, and all bends shall be made with standard conduit ells or conduits bent to, not less than, the same radius. Horizontal runs of exposed conduits shall be close to ceiling beams, passing over water or other piping where possible and shall be supported by pipe straps or by other approved means, not more than 5' apart. Installation of exposed conduits in finished areas of the building shall be checked with the Engineer for layout before installation to conform to the pattern of the structural members, an when completed, is to present the most unobtrusive appearance possible. No exposed conduits will be permitted on walls or partitions in public areas.

C. In no place shall a conduit be run within 3" of hot water pipes, or appliances, except where crossing is unavoidable and, in that case, the conduit shall be kept at least 1" from covering or pipe crossed.

D. Conduits shall be supported on approved type if galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of toggle bolts on hollow

masonry units or expansion bolts in concrete or brick, matching screws on metal surfaces and wood screws on wood construction. No nails shall be used as a means of fastening boxes or conduits.

E. In general, no splices or joints will be permitted in either feeder or branches except at outlets or accessible junction boxes.

F. All splices in wire #8 AWG and smaller shall be standard pigtail, made mechanically tight, soldered and insulated with proper thickness of insulating tape. Wire splicing nuts as manufactured by Minnesota Mining Company (Scotch Lock) or Ideal wire nuts may be used, subject to the local wire inspector.

G. Wire #6 and larger shall be connected to panels and apparatus by means of approved lugs or connectors. Connectors shall be solderless type, sufficiently large to enclosure all strands of the conductors and securely fastened.

3.4 CUTTING, PATCHING AND DRILLING

A. It shall be the duty of the Contractor to provide all cutting, patching, and drilling necessary for the electrical installation.

3.5 GROUNDING

A. The Contractor shall furnish all fittings, clamps, conduits and wire of proper size to make ground connections between all apparatus and conduit and the water piping as required by the latest edition of the National Electrical Code and as indicated on the Drawings. Any ground wires shall be run in conduit of size required by the National Electrical Code as amended by the Massachusetts Electrical Code.

3.6 QUIET OPERATION

A. All equipment and material furnished by The Contractor shall operate under all conditions of load without objectionable noises or vibrations, which, in the opinion of the Engineer, is objectionable. Where sound or vibration conditions arise which are considered objectionable by the Engineer, The Contractor shall eliminate same in a manner approved by the Engineer.

3.7 TESTS

A. Furnish all labor, material, instruments, supplies, and services and bear all costs for the accomplishment of tests herein specified. Correct all defects appearing under test, and repeat the tests until no defects are disclosed. Leave the equipment clean and ready for use.

3.8 FINAL INSPECTION AND TEST

A. Prior to test, feeders and branches shall be continuous from service contact point to each outlet; all panels, feeders and devices connected and fuses in place. Test system free from short circuits and grounds with insulation resistances not less than outlined in the National Electrical Code. Provide testing equipment necessary and conduct test in presence of the Owner's authorized representative.

3.9 GUARANTEE

A. All materials, items of equipment and workmanship furnished under this Section shall carry the standard warranty against all defects in materials and workmanship for a period of not less than one (1) year from the date of final acceptance of the work.

3.10 SLEEVES AND OPENINGS

A. Sleeves and openings for piping through walls, floors and other parts of the structure shall be provided at all points shown on the Contract Drawings and where indicated by the Engineer. The conduit shall go through the sleeve consisting of the next size conduit that will provide clearance. Sleeve ends shall be flush with surfaces.

3.11 WIRING METHODS

A. Electrical metallic tubing may be utilized for feeders, branch circuit wiring in the crawl spaces.

B. Branch circuit wiring for lighting and power shall be installed in electrical metallic tubing where branch circuit wiring is installed exposed.

3.12 SUPERINTENDENCE OF WORK

A. The Contractor shall give his personnel superintendence to the work and shall retain at the job tie during the period of construction, a competent foreman, satisfactory to the Engineer, who shall be in full charge of the work under this Section.

3.13 PROTECTION

A. The Contractor shall be responsible for his work and equipment until finally inspected, tested and accepted; careful storage of materials and equipment which are not immediately installed after delivery to site; and closure of open ends of work with temporary covers or plugs during construction to prevent entry of obstructing material.

3.14 SPECIAL COORDINATION INSTRUCTIONS:

A. Coordination with the work of other trades is referred to within various parts of this Section of the Specifications. The following special instructions shall also be carefully noted:

SECTION 26 00 00

ELECTRICAL (FILED SUB BID)

1. Locations of all wall outlets shall be verified with the Engineer prior to roughing-in conduits or cables. Refer to details and wall elevations on the drawings; mounting heights indicated on these drawings and/or specific dimensional information given to The Contractor by the Engineer shall take precedence over such information indicated on the electrical drawings.
2. If any discrepancy is found to exist between the electrical plans and any other drawings associated with the project, notify the Engineer at once and have location verified before work is installed. Any reasonable change in location of outlets and equipment prior to installation shall not involve additional expense to the Owner. The term "reasonable" shall be interpreted at moving outlets or equipment locations a maximum of ten (10) feet in any direction from the location indicated on the Drawings.
3. All feeder, branch circuit or auxiliary system wiring passing through pull boxes and/or being made up in panelboards shall be properly grouped, bound and tied together in a neat and orderly manner, in keeping with the highest standards of the trade, with plastic cable ties. Loose ends of the cable ties shall be properly trimmed after making up same. Cable ties shall be TY-Raps as manufactured by Thomas & Betts, or Holub Industries, Inc., Quick-Wrap, or Burndy Unirap, or equal.
4. Branch circuits and auxiliary system wiring shall be peeled out of the wiring gutters of the terminal cabinets and panels at 90 degrees to circuit breakers and terminal lugs for connecting to same.
5. Branch circuit wiring installed vertically through existing conduits and outlet boxes shall be color coded to reflect branch circuit origin and termination. See detail indicated on the drawings.
6. All duplex convenience and power receptacles shall be mounted vertically with the grounding post to the bottom as the outlet is viewed from the front.
7. At all points where steel support channels are cut and the unprotected steel is epoxed, two (2) coats of any approved rust preventative paint shall be applied to the bare surfaces, after proper cleaning. This requirement shall also apply to exposed job-cut threads of rigid steel conduit.
8. Color and type of rust preventative paint shall be as directed by the Engineer. In general, the paint for metals which are galvanized shall be aluminum paint and others will be of a zinc chromate type, or as otherwise approved.
9. All miscellaneous hardware and support accessories, including support rods, nuts, bolts, screws, and other such items, shall be of a galvanized or cadmium plated finish, or of other approved rust-inhibiting coatings. Care should be taken that fixtures shall not be installed on both sides of existing or new building expansion joints.
10. The Contractor shall provide all materials, equipment and workmanship to provide for adequate protection of all electrical equipment during the course of construction of the project. This shall also include protection from moisture and all foreign matter. The Contractor shall also be

responsible for damage which he causes to be done to the work of other trades and shall remedy any such injury at his own expense.

11. The Contractor shall furnish and install approved insulation at terminal connection points for all electrical conducting materials, such as transformer terminals, terminal studs, and at any other special locations as directed by the Engineer. The determination of whether or not such special live parts shall be insulated shall rest exclusively with the Engineer.
12. Specific reference is made to Article 380-8 of the National Electrical Code, relating to accessibility and mounting heights of switches and circuit breakers used as switches. It shall be herein understood that this article shall also apply to the mounting heights of switches and/or circuit breakers in panelboards. Switches and/or circuit breakers in panelboards shall be located so that they may be operated from a readily accessible place and shall be so installed that the center of the grip of the operating handle of the switch or circuit breaker, when in its highest position, will not be more than 6-1/2 (six and one-half) feet above the finished floor or working platform. It shall also be herein understood that this requirement shall take precedence over any contradictory notes, dimensions or details which may be indicated on the Contract Drawings. All panelboards shall be mounted at a height to conform to this requirement.

3.15 SECONDARY ELECTRICAL SERVICE

A. The existing secondary services is 120/208 volt three phase, four wire, originating at NSTAR pad mounted transformer.

3.16 COLOR CODING

A. Provide color coding for secondary service and feeders as follows:

PHASE	COLOR
A	Black
B	Red
C	Blue
Neutral	White
Equipment Ground	Green

B. Make connections to terminals from left to right arranged Phase A and C. Spiral or longitudinal color stripe (tracer), running full length of cable.

C. Printed numbers stamped every 12 inches on cable insulation.

D. Numbered wire markers, Brady or equal, at junction boxes and termination points.

E. Provide same color coding for switch legs as corresponding phase conductor.

F. Provide colored plastic tape of specified color code identification for large size conductors available only in black. Wrap tape three complete turns around conductor, at ends and at connections and splices.

3.17 EXTENSION OF CIRCUITS

A. The Electrical Contractor shall be responsible for the disconnection of any existing conduits required by the removal of existing equipment.

B. If any conduits to be retained, the Electrical Contractor shall make necessary alterations or relocations to conduit to provide continuity to outlets disrupted by the alteration.

END OF SECTION 26 00 00

SECTION 311000

SITE PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Examine all other Sections of the Specifications and drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section or implied on the drawings.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 SUMMARY

A. Provide all labor, materials, equipment, services and transportation required to complete all site preparation work as shown on Drawings, as specified herein, or both.

B. Include the following work:

1. Removing asphalt pavement and base.
2. Removing curbs
3. Removing designated site improvements.
4. Removal of vegetation.
5. Cutting and capping existing utilities to be abandoned
6. Tree Protection.
7. Clearing and grubbing.

C. See Drawings for locations and details.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. Section 31 00 00, EARTHWORK

B. Section 31 25 00, EROSION AND SEDIMENT CONTROL

C. Section 32 91 00, PLANTING PREPARATION

D. Section 32 93 20, SEEDING

E. Section 33 11 00, WATER DISTRIBUTION SYSTEM

F. Section 33 40 00, STORM DRAINAGE SYSTEMS

G. Section 32 10 00, BITUMINOUS PAVING

1.4 PERMITS AND CODES

A. All work shall comply with applicable codes, ordinances, rules, regulations and laws of all local, municipal, and state authorities having jurisdiction. All work necessary to make site preparation comply with such requirements shall be provided without additional cost to the Owner.

B. Procure and pay for all permits and licenses required for work under this Section. Give all required notices.

C. Do not close or obstruct any streets, sidewalks, alleys, or passageways, unless and until they have been discontinued by the appropriate municipal authority, or unless and until all necessary municipal and other permits therefore have been secured. No materials whatsoever shall be placed or stored in streets, alleys, or passageways until they have been so discontinued. Conduct all operations to interfere as little as possible with the use ordinarily made of roads, driveways, alleys, sidewalks, and other facilities near enough to the Work to be affected.

1.5 PROJECT CONDITIONS

A. Locate, protect, and maintain bench marks, monuments, control points and project engineering reference points. Re-establish disturbed or destroyed items at no additional expense to the Owner.

B. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks, and other adjacent facilities.

C. Obtain governing authorities' written permission when required to close or obstruct streets, walks and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.

D. Control dust caused by the work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.

E. Protect existing buildings, paving, and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and restoration of damaged items shall be at no additional expense to the Owner.

F. Adjust rim elevations on utility access structures such as manholes, clean outs, etc. to be flush with new grade elevations, unless otherwise indicated on drawings.

G. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.

H. Do not commence site clearing operations until temporary erosion and sedimentation control and tree protection measures are in place.

I. Soil Stripping, Handling and Stockpiling:

1. Perform only when the topsoil is dry or slightly moist.

1.6 PREVIOUS SITE PREPARATION

A. Contractor shall accept the site as received at the commencement of this Contract, including measures previously taken to alter, protect, stabilize and maintain site conditions.

B. Removal and disposal of temporary provisions is included in the work of this Section. Do all additional site preparation required for construction as further provided in this Section, in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.1 Not used.

PART 3 - EXECUTION

3.1 SITE CONDITIONS

A. Perform site preparation work before commencing construction.

B. Locate, protect, and maintain active utilities and site improvements to remain. Consult the records and drawings of adjacent work and of existing services and utilities which may affect site work operations.

C. Provide necessary barricades, coverings, and protection to prevent damage to existing improvements to remain.

D. Restore to original grades and conditions, areas adjacent to site disturbed or damaged as a result of site preparation work.

E. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.

3.2 REMOVAL OF EXISTING SITE IMPROVEMENTS

A. Remove existing site improvements within the limit of work line as indicated. Include the following:

1. Asphalt pavement
2. Concrete pads
3. Bituminous Curb
4. Signs
5. Other indicated items

B. Existing Utilities: Information on the Drawings relating to existing utility lines and services is from the best sources presently available. All such information is furnished only for information and is not guaranteed. Excavate test pits as required to determine exact locations of existing utilities.

C. Coordinate with the Owner on utilities to be removed or relocated so services to other buildings remain active and uninterrupted.

D. Remove existing paving, including base material, as required to accommodate new construction. Cut existing paving in neat, straight lines to provide uniform, even transition from new to adjacent existing work.

3.3 REMOVAL OF TREES AND SHRUBS

A. Before commencing other work under this Section, provide protection for trees and shrubs which are to remain. Refer to the Drawings and arrange a conference on the site with the Architect to identify and mark trees and shrubs which are to remain, removed and/or transplanted. Do no clearing without clear understanding of existing conditions to be preserved.

B. Exercise extreme care during excavation to prevent damage to roots of trees which are to remain. Owner shall be notified in advance of excavation within and adjacent to tree-protection zones and shall be present during the operation. When excavating or grading within the branch spread of trees to remain, do so in a manner which will cause minimum damage to root systems, as approved by Architect. Fell other trees in such a manner as not to injure trees to remain. Carefully remove branches which endanger life or property.

C. Exercise extreme care during excavation to prevent damage to roots of trees which are to remain. Owner shall be notified in advance of excavation within and adjacent to tree-protection zones and shall be present during the operation. When excavating or grading within the branch spread of trees to remain, do so in a manner which will cause minimum damage to root systems, as approved by Architect. When excavating within the root zone of trees to remain, all work shall commence by utilizing a Ditch Witch Vibratory Plow 410-SX or 420-SX with a new blade with a serrated edge to provide a clean cut of existing root system to a depth of 1′-6″ to 2′-0″. Open such trenches only when the utility can be installed immediately. Cover roots exposed at the wall of the excavation with wet burlap and water regularly. Backfill excavation with stockpiled soil and water as soon as possible.

D. Fell other trees in such a manner as not to injure trees to remain. Carefully remove branches which endanger life or property.

3.4 CLEARING

A. Prior to starting site clearing operations, stake out all roads, parking areas, and other paved areas, and limits of cut.

B. Clear areas as indicated or required of all trees, plants, stumps, branches and other debris and rubbish.

C. Vegetation and trees to be removed shall be chipped and the resultant material removed and disposed of offsite legally.

3.5 GRUBBING

A. Areas within the limits of clearing, except where fill of more than 3-1/2 feet in depth is required, shall be grubbed. Grubbing shall consist in grubbing-up and removing, for a depth of at least 12" below existing ground level, all stumps and roots 1-1/2" or more in diameter. All depressions excavated below the original ground surface, or caused by

the removal of stumps and roots, shall be refilled with suitable material compacted to the density, grade, and contour of the surrounding earth as specified in Section 310000 - EARTHWORK.

B. Remove completely stumps, foliage, brush, roots, and trees from areas to be occupied by building, parking areas, sidewalks, driveways, roads, and other such finished areas and for a distance of 10 feet outside of the building walls, except where otherwise indicated. Remove stumps and roots to a clear depth of not less than 2'-0" below subgrade level. At lawns only, depth shall be 1'-0" below finish grade. Sticks, stones, and roots over 2" in any dimensions shall be removed from loam designated for stockpiling. Legally dispose of all debris and rubbish away from the site.

C. Fill depressions caused by clearing and grubbing operations with general fill with 6″ of native stockpiled top soil on top unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 REMOVAL OF BITUMINOUS PAVEMENT

A. Existing pavement located within the limits of new landscaping shall have all pavement and gravel base removed and disposed of.

3.7 STRIPPING AND STOCKPILING TOPSOIL

A. Prior to starting general excavation, strip all topsoil within areas to be occupied by structures, pavements, steps, lawns, planting, and trenches, as well as all areas to be regraded, or used for construction operations, for later use in topsoiling and finish grading. Stockpile areas for topsoil shall be as directed by Architect. Should the topsoil be stockpiled in any area without prior approval of the Architect, Architect may direct Contractor to relocate such stockpile to another portion of the site, and the Contractor shall do so, at no additional cost to the Owner.

B. Do no stripping without clear understanding of existing soil, planting, and site conditions to be preserved. Topsoil shall be stripped its entire, natural depth, as determined by the Architect. Redistribution of topsoil is included as part of the work specified in other Sections. Do not remove topsoil from site without explicit written approval of Architect.

C. Do not strip topsoil in tree-protection zones.

D. Remove sod and grass before stripping topsoil.

E. All loam encountered during the stripping operation, regardless of depth, shall be removed, stockpiled, and covered on the site, where directed by Architect. Areas having greater depths of loam than reasonably anticipated shall be stripped of all loam, and ordinary fill shall be used to bring such areas to the rough-grade level. Sticks, stones, and roots over two (2) inches in any dimension shall be removed from loam before stockpiling. All other stripped material which can be classified as fill under EARTHWORK 310000 shall be used or stockpiled for re-use in rough-grading or backfill.

F. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

G. Surplus topsoil and fill not required to fulfill the requirements of the Contract shall become the property of the Contractor and shall be removed from the site and legally disposed of.

3.8 DISPOSAL OF WASTE MATERIALS

A. Remove, haul from site, and legally dispose of all waste materials and debris not required to be saved. Accumulation is not permitted.

B. Maintain disposal routes clear, clean, and free of debris.

C. On-site burning of combustible cleared materials is not permitted.

D. Cover trucks used for hauling, follow approved routes, obtain disposal permits required and pay all fees in connection with disposal of materials removed.

E. Upon completion of site preparation work, clean areas of work, remove tools and equipment. Provide site clear, clean, and free of materials and debris and suitable for site construction operations.

3.9 SALVAGEABLE MATERIALS

A. Remove and stockpile at the direction of Architect all materials indicated to be salvaged.

B. Salvaged items shall include suitable topsoil, and fill materials and other materials indicated to be saved and/or re-used.

C. All removed materials, items, and equipment not indicated to be saved shall be the property of the Contractor and shall be removed from the site and legally disposed of.

D. Remove non-salvage materials from site as work progresses. Storage and sale of Contractor's salvage items on site is not permitted.

E. Any items salvaged but not ultimately used in the project shall become the property of the Contractor and disposed of legally.

END OF SECTION

SECTION 312500

EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

B. Examine all other Sections of the Specifications and drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section or implied on the drawings.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. Environmental Pollution Agency – Compliance with the National Pollution Discharge Elimination Scheme (NPDES) Program.

1.2 WORK INCLUDED

A. Provide all equipment and materials, and do all work necessary to construct a complete erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions detailed on the Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles specified herein.

B. Contractor shall be responsible for applying for a NPDES Permit, and complying with the approved Storm Water Pollution Prevention Plan (SWPPP) as developed by the Owners Rep.

1.3 RELATED WORK

A. Section 02 41 13 23, UTILITY LINE REMOVAL.

B. Section 31 00 00, EARTHWORK.

C. Section 32 12 16, ASPHALT PAVING.

D. Section 32 13 00, CONCRETE PAVING

E. Section 32 16 40, GRANITE CURB.

F. Section 33 10 00, WATER SYSTEM.

G. Section 33 30 00, SANITARY SEWAGE SYSTEM.

H. Section 33 40 00, STORM DRAINAGE SYSTEM.

1.4 SUBMITTALS

A. Proposed methods, materials to be employed, and schedule for effecting erosion and siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:
   1. Proposed methods for effecting erosion and siltation control including 1"=20' scale plans indicating location of erosion control devices.
   2. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.
   3. List of proposed materials including manufacturer's product data.

B. The following shall be submitted:
   1. Filter Fabric - 12 x 12 in. sample
   2. Seed mixture for temporary seed cover shall be submitted.
   3. Catch Basin filters
   4. Straw Wattles

1.5 INSPECTION:

A. Upon installation of all soil erosion and sediment control devices, the Contractor shall notify and coordinate a site inspection with the Architect.

1.6 EROSION CONTROL PRINCIPALS

A. The Contractor shall implement all soil erosion and sediment control devices prior to excavation within the site.

B. The following erosion control principles shall apply to the land grading and construction phases:
   1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.
   2. Whenever feasible, natural vegetation shall be retained and protected.
   3. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.
   4. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
   5. Sediment shall be retained on-site.

6. Erosion control devices shall be installed as early as possible in the construction sequence prior to the start of clearing and grubbing operations and excavation work.

C. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with permanent erosion protection when erosion exposure period is expected to be greater than or equal to six months, and temporary erosion protection when erosion exposure period is expected to be less than six months.
   1. Temporary erosion protection shall be accomplished by covering with erosion protection materials, as appropriate for the prevailing conditions.
   2. Except where specified slope is indicated on Drawings, fill slopes shall be limited to a grade of 2:1 (horizontal: vertical), cut slopes shall be limited to a grade of 1.5:1.

PART 2 - PRODUCTS

2.1 CATCH BASIN FILTERS:

A. Siltsack® shall be manufactured from a specially designed woven polypropylene geotextile manufactured by SI® Geosolutions and sewn by a double needle machine, using a high strength nylon thread. SI Geosolutions: www.sigeosolutions.com, (800)621-0444 or approved equal.

B. Siltsack® will be manufactured to fit the opening of the catch basin or drop inlet. Siltsack® will have the following features: two dump straps attached at the bottom to facilitate the emptying of Siltsack®; Siltsack® shall have lifting loops as an integral part of the system to be used to lift Siltsack® from the basin; Siltsack® shall have a restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls, this yellow cord is also a visual means of indicating when the sack should be emptied.

2.2 SILTATION FENCE

A. Geotextile Fabric shall consist of long-chain synthetic polymers, composed of at least 85% by weight polylefins, polyesters, or polymides. They shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including selvedes. The geotextile fabric shall have the following properties:

Property(ASTM Test Method)	**Unit**	**Typical Values**
Grab Strength (D-4632-86)	lbs	100
Grab Elongation (D-4632-86)	%	30(Max)
Trapezoid Tear Strength (D-4533-85)	lbs	65
Mullen Burst Strength (D-3786-80a)	psi	280
Coeff. of Permeability (D-4491-85)	cm/sec	0.01
Water Flow Rate (D-4491-85)	gal/min/(ft)(ft)	35
Ultraviolet Stability (D-4355-84)	%	90

B. Support fence posts shall be at least 48 inches high and strong enough to support applied loads. The Contractor shall have the option of using wood or metal posts. Wood posts shall consist of 1 ½" square, kiln dried, hardwood posts. Steel posts of U, T, L, or C shape weighing 1.3 pounds per linear foot may be substituted for wood. In soft ground, swamps, etc., a wider post is advantageous as additional passive resistance needs to be developed. Filter fabric shall be attached to wood posts with staples and with 13 gage minimum, galvanized steel wire for steel post application.

C. Prefabricated fence systems may be used provided they meet all of the above material requirement. Filter fabric shall be one of the following or approved equal:

Product	Manufacturer
Trevira Spunbound Fabric Type 1120	Hoechst Fibers Industries Spartansburg, SC 29304
Supac N 5NP(UV)	Phillips Fibers Corporation Greenville, SC 29602
Mirafi 160N	Mirafi, Inc. Charlotte, NC 28224

D. Fencing other than that specified above shall be subject to review and acceptance by Architect.

2.3 STRAW WATTLES

A. Straw wattles shall have cylindrical exterior of jute or high-density polyethylene netting and an interior composed of certified seed free agricultural straw, and have diameter of 12" minimum.

2.4 TEMPORARY SEED COVER

A. Grass seed for temporary seed cover shall be previous year's crop. Not more than 0.5% by weight shall be weed seed and not more than 1.75% by weight crop seed. Seed shall be delivered to the site in sealed containers, labeled with name of seed grower and seed formula, in form stated below. Seed shall be dry and free of mold. Seed shall meet the following requirements:

Species Name	in Mixture	Germination	Purity
Chewing Fescue *(Festuca Rubra Comutata)*	25	85	97
Alta Fescue *(Festuca Arundinacea)*	30	85	97
Annual Rye Grass *(Lolium Multiflorum)*	20	90	98
Red Top *(Agrostis Alba)*	15	90	92
White Clove (Trifolium Repens)	10	90	98

2.5 CONSTRUCTION ENTRANCE

A. Filter fabric shall conform to Section 311100(2.3)(A) (without wire-bound woodroll fence).

B. Stone shall be clean, crushed stone, with a ranging from 1 ½" to 2 ½" in size.

C. Top dressing shall be clean, 2" crushed stone.

PART 3 - EXECUTION

3.1 CATCH BASIN FILTER

A. Catch basin filters shall be placed at all inlets to drainage structures as structures are installed and prior to pavement removal. Outlet protection work shall be constructed before runoff is allowed to enter the drainage system. Construction and location of catch basin filters shall be as indicated on the Drawings.

B. Once the strap is covered with sediment, Siltsack® should be emptied, cleaned and placed back into the basin.

3.2 STRAW WATTLES

A. Straw wattles shall be installed as indicated on the Drawings.

3.3 CONSTRUCTION ENTRANCE

A. The area of the construction entrance should be cleared of all vegetation, roots, and other objectionable material. The filter fabric should be placed on the subgrade prior to the gravel placement. The gravel shall be placed to the specified dimensions depicted on the plans.

B. The Construction entrance shall be a minimum of 50-feet in length and 10-feet wide.

3.4 TEMPORARY SEED COVER

A. Grass seed shall be spread by mechanical spreader at a rate of 0.40 lb./100 sq. ft.

B. Following seeding, area shall be lightly raked to mingle seed with the top 1/8 to ¼ in. of soil. Areas shall then be smoothed and rolled.

C. Following rolling, entire area shall be watered until equivalent of a 2 in. depth of water has been applied to entire seeded surface, at a rate which will not dislodge seed. Watering shall be repeated thereafter as frequently as required to prevent drying of surface, until grass attains an average height of 1-1/2 in.

D. At the Contractor's option, seed may be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed and mulch shall be mixed and applied to achieve application quantities specified herein for the conventional seeding method, with mulch applied at the rate stated in the table below. A mulching machine, acceptable to the Developer, shall be equipped to eject the thoroughly wet mulch material at a uniform rate to provide the mulch coverage specified. Other provisions specified above for conventional seeding shall apply to hydroseeding.

1. If the results of hydroseeding are unsatisfactory the mixture and/or application rates and methods shall be modified to achieve the desired results.

2. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas seeded repeatedly until all areas are covered with a satisfactory growth of grass.

Application Rates	
Slope Gradient/Condition	English
≤ 3H to 1V	3000 lb/ac
> 3H to 1V and ≤ 2H to 1V	3500 lb/ac
> 2H to 1V and ≤ 1H to 1V	4000 lb/ac
> 1H to 1V	4500 lb/ac

3.5 SILTATION FENCE

A. Siltation fence shall be constructed along the Limit of Excavation and installed as indicated on the Drawings, prior to the start of clearing and grubbing operations.

3.6 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES

A. Erosion Control Devices
   1. Sediment behind the erosion control device shall be checked in accordance with the SWPPP.

B. Removal of Erosion Control Devices
   1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
   2. Erosion protection material shall be kept securely anchored until start of permanent turf construction.
   3. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire project, whichever is later.

END OF SECTION

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SECTION 321216

ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Examine all other Sections of the Specifications and drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section or implied on the drawings.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. All work shall conform to the Town of Bedford Department of Public Works (DPW) Standards for Materials and Construction.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, services and transportation required to complete all bituminous concrete paving work as shown on Drawings, as specified herein, or both.

1.3 RELATED WORK

A. Section 31 00 00, EARTHWORK.

B. Section 31 25 00, EROSION AND SEDIMENT CONTROL.

C. Section 32 16 40, GRANITE CURB.

D. Section 32 13 13, CONCRETE PAVING.

E. Section 32 17 13, PAVEMENT MARKINGS.

F. Section 33 10 00, WATER SYSTEM.

G. Section 33 30 00, SANITARY SEWER SYSTEM.

H. Section 33 40 00, STORM DRAINAGE SYSTEM

1.4 WORK INCLUDED

A. Perform all work required to complete the work of the Section, as indicated. Bituminous Concrete Paving work includes, but is not limited to, the following: Bituminous Pavement

1.5 REFERENCES

A. ASTM American Society for Testing and Materials, Annual Book of Standards, Latest Edition.

B. All work shall conform to the Town of Bedford Department of Public Works (DPW) Standards for Materials and Construction.

C. All Work shall conform to codes and standards of the following: Massachusetts Department of Transportation (MassDOT): Standard Specifications for Highways and Bridges.

1.6 PROJECT CONDITIONS

A. Protection: The Contractor shall use all means necessary to protect the materials of this Section before, during, and after installation. In the event of damage, make all repairs and replacements necessary to approval of the Owner's Representative and at no additional cost to the Owner. All work shall be executed in such a manner as to prevent any damage to existing streets, curbs, paving to remain, existing plant materials, and adjoining properties.

B. The Contractor shall remove all debris, construction equipment, and waste material from areas within the limit of work prior to inspection for acceptance.

1.7 SUBMITTALS

A. Submit manufacturer's product data for the following:
   1. Bituminous Pavement Mixes
   2. Complete bituminous concrete job mix formula, listing quantities and pertinent ingredient properties, shall be submitted to and approved by the Architect at least two weeks before work is scheduled to begin.

1.8 DELIVERY, STORAGE, AND HANDLING

A. All products and supplies shall be delivered to the job adequately protected from damage during transit.

B. All products and supplies shall be stored off the ground and shall be protected against damage. Damaged products and/or supplies will be rejected and shall not be employed in the work.

1.9 QUALITY ASSURANCE

A. Unless otherwise specified, work and materials for construction of the bituminous concrete paving shall conform to the applicable portions of the following:
   1. MassDOT Specifications Section 460 for bituminous pavement for roadways and parking areas, Section 701 for bituminous sidewalks, and Section 405 for aggregate base course
   2. MassDOT Specifications Section 472 for repairs to existing pavements after installation of new curb.

B. Paving work, base course etc., shall be done only after excavation and construction work which might injure them has been completed. Damage caused during construction shall be repaired before acceptance.

C. Repair and replace existing paving areas damaged and removed during this Project. Workmanship and materials for such repair and replacement shall match those employed in existing work, except as otherwise noted.

D. Pavement subbase shall not be placed on a muddy or frozen subgrade.

E. Existing pavement under state or local jurisdiction shall, if damaged or removed during the course of this project, be repaired or replaced under this section of the specification in conformance with applicable codes, standards, and practices.

F. The Owner reserves the right to retain an independent testing laboratory to perform inspection and testing of paving and associated.

1.10 ADA AND MAAB COMPLIANCE

A. Special attention is to be given to compliance with the Americans with Disabilities Act (ADA) and the requirements of the Massachusetts Architectural Access Board (MAAB).
   1. Slopes: All Walkways (as defined by Section 22.1 of 521 CMR) shall be graded to a maximum 4.8%. The cross pitch (perpendicular to travel) for all walkways and paths shall be constructed at 1.5%. The slope of all ramps and side slopes of handicap curb cuts as defined by Section 21.1 of 521 CMR shall be constructed at 8.3% maximum. Ramps (as defined in section 24.1 of 521 CMR) shall be constructed to a maximum slope of 8.3%. Accessible Parking Spaces and loading zones (as defined by Section 23.0 of 521 CMR) shall be level with a surface slope not exceeding 1.9% in all directions
   2. The Contractor is to assume that all grades in pedestrian paths of travel shall be verified/checked with a 2-foot electronic "Smart Level".

B. The above requirements shall supersede the grades shown on the plans. If these requirements cannot be met with the grades shown on the plans, the Architect shall be notified immediately for direction.

C. Areas installed not meeting the above requirements will be removed and replaced at the Contractor expense.

PART 2 - PRODUCTS

2.1 GRAVEL SUB-BASE

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.

B. Material for aggregate base shall conform to MassDOT Specifications Section M1.03.0 Type a or b (Gravel Borrow).

2.2 DENSE GRADED CRUSHED STONE FOR SUB-BASE

A. Materials shall meet the requirements specified in the MassDOT Specifications Section M2.01.7.

B. Material for aggregate base shall conform to MassDOT Specifications Section M2.01.7 Dense Graded Crushed Stone.

2.3 RECLAIMED BASE COURSE

A. The work shall consist of scarifying and pulverizing the inplace pavement and underlying material, mixing and/or blending the materials and spreading and compacting resultants mixture to the lines and grades shown on the plans or established by the Architect.

B. All scarified and pulverized material shall pass the 3-inch sieve. Material for blending shall conform to the following requirements:
   1. MassDOT Specification Section M1.03.0 Gravel Borrow, Type b.

2.4 GRAVEL BASE COURSE

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation. Material for aggregate base shall conform to the following
   1. MassDOT Specifications Section M1.03.0 Gravel Borrow Type b.

2.5 BITUMINOUS CONCRETE BASE COURSE

A. Bituminous concrete base course shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, mineral aggregate, mineral filler, and bituminous material conforming to MassDOT Specifications Section M3.11.00

B. Job Mix Formula shall comply with Table A mixes as specified in MassDOT Specifications Section M3.11.03

C. Binder or bottom course paving for roadways and parking lots shall have maximum aggregate size passing 1 in. sieve.

2.6 BITUMINOUS CONCRETE WEARING COURSE

A. Bituminous concrete base course shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, mineral aggregate, mineral filler, and bituminous material conforming to MassDOT Specifications Section M3.11.00

B. Job Mix Formula shall comply with Table A mixes as specified in M3.11.03

C. Top or wearing course paving for roadways and parking lots shall have maximum aggregate size passing 5/8 in. sieve.

D. Top or wearing course paving for sidewalks shall conform to composition for "Dense Mix".

2.7 BITUMINOUS MATERIALS

A. Bituminous material for tack coat shall be one of the following:
   1. Cut-back asphalt (rapid-curing type) conforming to AASHTO M81, Grade RC-70 or M3.02.0
   2. Emulsified asphalt rapid-setting type conforming to AASHTO M140, Grade RS-1 M3.03.0.

B. Bitumen shall be a rapid-setting type emulsified asphalt conforming to AASHTO M 140, Grade RS-1.

C. Bituminous crack sealer shall be a hot-applied bituminous sealer conforming to Fed. Spec. SS-S-1401.and MassDOT M3.05.4

PART 3 - EXECUTION

3.1 GRADING

A. Areas to be paved will be compacted and brought approximately to subgrade elevation before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to be paved shall be recompacted as required to bring top 9 in. of material immediately below gravel base course to a compaction of at least 90% of maximum dry density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this section, and unsuitable or excess material maintained for completing work of this Section shall be legally disposed of off-site.

H. Prepared subgrade will be inspected by the Architect. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section.

I. Compaction of subgrade shall continue until the surface is true and even to the proposed lines and grades within a tolerance of 1 inch above or below the required cross sectional elevations and the maximum irregularity not exceeding 1 inch under a 10 foot line longitudinally.

3.2 GRAVEL SUB-BASE

A. Gravel shall be spread and compacted in layers not exceeding 8 inches in depth, except the last layer of gravel sub-base (conforming to MassDOT Specification Section M1.03.0 Type B) will be 4" in depth. Layers shall be compacted to 95 percent of the maximum dry density of the material as determined by Standard AASHTO Test Designation T99 compaction test Method C at optimum moisture content as determined by the Architect.

B. Any stone with a dimension greater than that permitted for the type of gravel specified shall be removed from the sub-base before the gravel is compacted. Compaction shall continue until the surface is true and even to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and the maximum irregularity not exceeding 3/8 inch under a 10 foot line longitudinally. In locations when 8" of gravel is used for Gravel Base Course this tolerance shall be 3/4 inch under a 10' line.

C. Any area of gravel sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.

3.3 DENSE GRADED CRUSHED STONE SUB-BASE

A. Dense graded crushed stone shall be spread and compacted in layers not exceeding 8 inches in depth, except the last layer of gravel sub-base (conforming to MassDOT Specification M1.03.0 Type B) will be 4" in depth. Layers shall be compacted to 95 percent of the maximum dry density of the material as determined by Standard AASHTO Test Designation T99 compaction test Method C at optimum moisture content as determined by the Architect.

B. Any stone with a dimension greater than that permitted for the type of gravel specified shall be removed from the sub-base before the gravel is compacter. Compaction shall continue until the surface is true and even to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and the maximum irregularity not exceeding 3/8 inch under a 10 foot line longitudinally. In locations when 8" of gravel is used for Gravel Base Course this tolerance shall be ¾ inch under a 10' line.

C. Any area of dense graded crushed stone sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.

3.4 RECLAIMED BASE COURSE

A. Prior to scarifying and pulverizing the existing pavement, the Contractor shall locate and protect existing drainage and utility structures and underground pipes, culverts, conduits and other appurtenances. If the upper sections of the utility structures are removed to facilitate scarifying and pulverizing the existing pavement, the remaining part of the structure shall immediately be covered with a steel plate capable of withstanding a 36.5 ton truck load with impact.

B. The Contractor shall submit to the Architect for approval a description of the equipment and the process to be used for scarifying and pulverizing the existing pavement. The pulverizing operation shall be controlled in such a manner that the resultant material will be free from excessive fine material (materials passing the No. 200 sieve). The Architect will determine the acceptable level of fine material.

C. The bituminous pavement and underlying material shall be scarified to the depths shown on the plans or established by the Architect and pulverized and mixed to produce a consistent homogeneous material, 100 percent passing the 3-inch sieve and without an excess of material passing the No. 200 sieve. If the Architect directs, Gravel Borrow (type b) shall be blended with the pulverized material in quantities to be established by the Architect to produce a blend suitable for use as a base course.

D. Unsuitable materials in the subgrade shall be removed to the lines and depths established by the Architect and replaced with Gravel Borrow.

E. The mixed and/or blended base course material shall be spread and compacted in accordance to the requirements of Gravel Sub-Base.

3.5 GRAVEL BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following: MassDOT Specifications Section 405, "Gravel Base Course".

B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.

C. Width of base course shall be greater than the width of pavement surface, and shall extend at least 2 x base thickness beyond edge of the course above.

D. Aggregate material shall be applied in lifts less than or equal to 4 in. thick, compacted measure. Each lift shall be separately compacted to specified density.

E. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.

F. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.

G. Surface irregularities which exceed 1/2 in. using a 10 ft. long straightedge shall be replaced and properly compacted.

H. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.

I. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.6 BITUMINOUS PAVING

A. Bituminous paving mixture, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base, etc., shall conform to MassDOT Specifications Section 460 Class I Bituminous Concrete Pavement for roadway and parking areas.

B. Bituminous binder and wearing surface courses shall each be applied individually, in single lifts of full thickness indicated on the Drawings.

C. Work shall not be performed during rainy weather or when temperature is less than 40 degrees F.

D. Adjacent concrete work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original condition.

E. The surface of the pavement to be resurfaced shall receive a bituminous prime coat before laying bituminous binder course. Prime coat shall be applied at rate which will leave Bituminous residue of 5 to 7 gal./100 sq. yd. after evaporation of street. Base surface shall be dry and clean when prime coat is applied. Bituminous paving material shall not be placed until vehicle has completely evaporated from prime coat. Adjoining new paving shall be placed before prime coat has dried or dusted over.

F. Deliveries shall be timed to permit spreading and rolling all material during daylight hours, unless artificial light, satisfactory to the Architect, is provided. Loads which have been wet by rain or otherwise will not be accepted. Hauling over freshly laid or rolled material will not be permitted.

G. Placing and rolling of mixture shall be as nearly continuous as possible. Rolling shall begin as soon after placing as mixture will bear the operation without undue displacement. Delays in rolling freshly spread mixture will not be permitted. Rolling shall proceed longitudinally, starting at edge of newly placed material and proceeding toward previously rolled areas. Rolling overlap on successive strips shall be greater than or equal to 1/2 width of roller rear wheel. Alternate trips of roller shall be of slightly different lengths. Corrections required in surface shall be made by removing or adding materials before rolling is completed. Skin patching of areas where rolling has been completed will not be permitted. Course shall be subjected to diagonal rolling, crossing lines of the first rolling while mixture is hot and in compactable condition. Displacement of mixture or other fault shall be corrected at once by use of rakes and application of fresh mixture or removal of mixture, as required. Rolling of each course shall be continued until roller marks are eliminated. Roller shall pass over unprotected edge of course only when paving is to be discontinued for sufficient time to permit mixture to become cold.

H. In places not accessible to roller, mixture shall be compacted with hand tampers. Hand tampers shall weigh at least 50 lb. and shall have a tamping face less than or equal to 100 sq. in. Mechanical tampers capable of equal compaction will be acceptable in areas in which they can be employed effectively.

I. Portions of pavement courses which become mixed with foreign material or are in any way defective shall be removed, replaced with fresh mixture, and compacted to density of surrounding areas. Bituminous material spilled outside lines of finished pavement shall be immediately and completely removed. Such material shall not be employed in the work.

J. Joints shall present same texture, density, and smoothness as other sections of the course. Continuous bond shall be obtained between portions of existing and new pavements and between successive placements of new pavement. New material at joints shall be thick enough to allow for compaction when rolling. Compaction of pavement, base, and subgrade at joints shall be such that there is no yielding of new pavement relative to existing pavement when subjected to traffic.

K. Contact surfaces of previously constructed pavement (if greater than or equal to seven days since binder placed), manholes, and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate which will leave asphaltic residue of 5 to 7 gal./100 yd.^{2} after evaporation of vehicle. Base surface shall be dry and clean when tack coat is applied. Bituminous paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be placed before tack coat has dried or dusted over.

L. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 1 ft. of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface. Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.

M. After final rolling, vehicular traffic shall not be permitted on pavement until it has cooled and hardened, and in no case less than six hours.

N. Variations in smoothness of finished surface shall be less than or equal to the following tolerances when tested with a 10 ft. rolling straightedge, applied both parallel to and at right angles to centerline of paved area:
   1. For roadway and parking pavement surface course - 1/4 in. in 10 ft.
   2. At joint with existing pavement, and at other locations where an essentially flush transition is required, pavement elevation tolerance shall not exceed 0.01 ft.
   3. At other areas pavement elevation tolerance shall not exceed $\pm$ 0.05 ft.

   Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this Section for a distance of 30 feet in all directions of the irregularity.

3.7 REPAIRS TO EXISTING PAVEMENT

A. Subgrade shall be done in strict accordance with Site Preparation Section.

B. Aggregate base course shall be replaced in strict conformance with this section.

C. Bituminous concrete paving mixture, equipment, and methods of mixing and placing shall conform to MassDOT Specifications Section 472 for Bituminous Concrete for Patching, and this section.

END OF SECTION

SECTION 32 13 13
PEDESTRIAN PAVEMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Examine all other Sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this Section.

B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 WORK INCLUDED

A. Provide concrete walks as shown and specified. The work includes:

1. Cement Concrete Pavement at Sidewalks
2. Bituminous Asphalt Pavement at Sidewalks

B. See Drawings for location and details.

1.3 RELATED WORK

A. Section 323000- Site Improvements

C. Section 32900- Exterior Plants

1.4 QUALITY ASSURANCE

A. The Owner will provide and pay for testing and inspection during concrete operations.

B. Materials and methods of construction shall comply with the following standards:

1. Massachusetts Department of Transportation's *Standard Specifications for Highways and Bridges*, 1988 (MDOT),herein referred to as the Standard Specification.
2. American Society for Testing and Materials, (ASTM).
3. American Concrete Institute, (ACI).

C. Maintain field records of time, date of placing, curing, and removal of forms from concrete for each portion of work.

D. Do not change source or brands of cement and aggregate materials during the course of the work.

E. Cement Concrete Pavement

1. C94/ C94M Production Facilities and Equipment

2. C1077, E329 Testing Agency Qualifications

1.5 SUBMITTALS

A. Product data:

1. Submit complete materials list of items proposed for the Work. Identify materials source.
2. Submit admixture, curing compound, retarder, and accessory item product data.
3. Submit material certificates for aggregates, reinforcing and joint fillers.

B. Submit concrete delivery tickets. Each ticket shall contain the following:

1. Batch number
2. Mix by class or sack content with maximum size aggregate
3. Admixtures
4. Air content
5. Slump
6. Time of loading

C. Submit concrete test reports to verify mix design.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver curing materials, admixtures, and retarders in manufacturer's standard unopened containers with labels legible and intact. Store and protect from freezing and damage.

B. Deliver, mix, and place concrete in accordance with cited standards and Testing Agency instructions.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

A. All Concrete Paving: Shall be 4,000 psi design compressive strength 5-7% air-entrained concrete conforming to requirements of Section M4 of the Standard Specification.

B. Welded Wire Fabric: Shall conform to ASTM A-185. Size shall be 6" x 6" - W1.4 x W1.4, or as otherwise indicated on the Drawings. Reinforcement shall be free from imperfections and surface coating of rust, dirt, oils, paint, grease and mill scale, and shall present a clean, fresh surface. Rust that occurs in scales or that pits the steel will be considered an imperfection. Surface rust shall be brushed to remove loose materials.

C. Steel Dowels: Shall be 1/2" by 12", hot-dipped galvanized medium carbon, ASTM-A36, smooth steel dowels.

2.2 ACCESSORIES

A. Compacted Base: Shall be dense graded crushed stone as per Standard Specification, Section M2.01.7.

B. Forms: Shall be wood or metal of sufficient strength to resist concrete placement pressure and to maintain horizontal and vertical alignment during concrete placement. Provide forms straight, free of defects and distortion, and of a height equal to full depth of concrete work. Provide 2" nominal thickness, surfaced plank wood or metal forms for straight sections. Use flexible metal or plywood to form radius bends.

C. Curing Compound: ASTM C309, non-yellowing, non-staining liquid membrane-forming type containing a fugitive dye. Chlorinated rubber compounds are not acceptable for exterior use.

D. Form Release Agent: Non-staining chemical form release agent free of oils, waxes, and other materials harmful to concrete.

2.3 BITUMINOUS ASPHALT PAVEMENT

GRAVEL SUB-BASE

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.

1. Material for aggregate base shall conform to DOT Standard Specifications Section M1.03.0 Type a or b (Gravel Borrow)

DENSE GRADED CRUSHED STONE FOR SUB-BASE

A. Materials shall meet the requirements specified in the MHD M2.01.7

1. Material for aggregate base shall conform to DOT Standard Specifications Section M2.01.7 Dense Graded Crushed Stone

RECLAIMED BASE COURSE

A. The work shall consist of scarifying and pulverizing the in place pavement and underlying material, mixing and/or blending the materials and spreading and compacting resultants mixture to the lines and grades shown on the plans or established by the Engineer.

B. All scarified and pulverized material shall pass the 3-inch sieve. Material for blending shall conform to the following requirements:

1. Gravel Borrow, Type b.

GRAVEL BASE COURSE

A. Material for aggregate base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation.

1. Material for aggregate base shall conform to DOT Standard Specifications Section M1.03.0 Type b (Gravel Borrow)

BITUMINOUS CONCRETE BASE COURSE

A. Bituminous concrete base course shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, mineral aggregate, mineral filler, and bituminous material conforming to DOT Standard Specifications Section M3.11.00

B. Job Mix Formula shall comply with Table A mixes as specified in M3.11.03

1. Binder or bottom course paving for roadways and parking lots shall have maximum aggregate size passing 1 in. sieve.

BITUMINOUS CONCRETE WEARING COURSE

A. Bituminous concrete base course shall be a standard plant-mixed, hot-laid paving material for road work, consisting of clean, mineral aggregate, mineral filler, and bituminous material conforming to DOT Standard Specifications Section M3.11.00

B. Job Mix Formula shall comply with Table A mixes as specified in M3.11.03

1. Top or wearing course paving for roadways and parking lots shall have maximum aggregate size passing 5/8 in. sieve.

2. Top or wearing course paving for sidewalks shall conform to composition for "Dense Mix".

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Work notification: Notify Landscape Architect at least 24 hours prior to placing concrete.

B. Establish and maintain required lines and grade elevations.

C. Do not install concrete over wet, saturated, muddy, or frozen subgrade.

D. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.

E. Protect adjacent work.

F. Provide temporary barricades and warning lights as required for protection of project work and public safety.

3.2 PREPARATION

A. Compact Subbase and Base will be placed under EARTHWORK Section.

B. Examine subgrades and installation conditions. Do not start concrete work until unsatisfactory conditions are corrected.

C. Proof roll the subgrade and do all necessary rolling and compacting to obtain firm, even subgrade surface. Fill and consolidate depressed areas. Remove uncompactable materials; replace with approved fill and compact as specified in EARTHWORK Section.

D. Remove loose materials and debris from base surface before placing concrete.

E. Install, align, and level forms. Stake and brace forms in place. Maintain following grade and alignment tolerances:

1. Top of form: Maximum 1/8" in 10'-0"
2. Vertical face: Maximum 1/4" in 10'-0"

F. Coat form surfaces in contact with concrete with form release agent. Clean forms after each use and coat with form release agent as necessary to assure separation from concrete without damage.

G. Locate, place, and support reinforcement as indicated. Provide a single layer of welded wire fabric in all concrete walks and slabs.

H. Place steel dowels spanning expansion joints.

I. Install, set, and build-in work furnished under other Sections. Provide adequate notification for installation of necessary items.

3.3 CONCRETE PLACEMENT

A. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.

B. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing and curing. In cold weather comply with ACI 306, "Recommended Practice for Cold Weather Concreting." In hot weather comply with ACI 305, "Recommended Practice for Hot Water Concreting."

C. Moisten base to provide a uniform dampened condition at the time concrete is placed.

D. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating concrete. Exercise care during spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.

E. Place concrete in a continuous operation between expansion joints. Provide construction joints when sections cannot be placed continuously. Construction joints shall be doweled in the same manner as expansion joints.

F. Place concrete in one course monolithic construction for the full width and depth of concrete work. Depth of concrete shall be as indicated on the Drawings.

G. Strike-off and bull-float concrete after consolidating. Level ridges and fill voids. Check surface with a 10'-0" straightedge. Fill depressions and refloat repaired areas. Darby the concrete surface to provide a smooth level surface ready for finishing.

H. Apply Bomanite Color Hardener evenly to the plastic surface by the dry-shake method using a minimum of 60 pounds per 100 square feet. It shall be applied in two or more shakes, floated after each shake, and troweled only after the final floating.

I. While concrete is still in its plastic state, apply the tool/texture pattern to the surface of the concrete. Properly tamp tools into the surface to achieve the required texture, with uniformity of pattern and depth of stamping. Utilize bond breaker to keep tools from sticking to fresh concrete.

1. Release material shall be applied to the troweled surface prior to imprinting

3.4 JOINTS

A. Construct contraction joints properly aligned perpendicular to concrete walk direction.

B. Provide tooled contraction joints, sectioning concrete into areas indicated. Tool joints to depth equal to no less than one-fourth (1/4) of the concrete thickness. Hand tool contractions joints in

pattern and at spacing indicated. When not indicated, provide spacing equal to slab width and not greater than 10'-0" on centers.

C. Provide expansion joints using premolded joint filler at concrete work abutting walls, structures, and fixed objects and where indicated. Provide steel dowels as indicated on Drawings.

D. Install joint fillers full-width and depth of joint. Recess top edge below finished surface where joint sealants are indicated. Provide joint fillers in simple lengths for full slab width, whenever possible. Fasten joint filler sections together when multiple lengths are required. Protect the top edge of the joint filler during concrete placement. Use closed cell backer rod over joint filler where sealants are required.

3.5 CURING

A. Cure concrete with a non-staining liquid membrane-forming compound. Spray apply in accordance with manufacturer's recommended coverage rate.

B. Apply curing compound immediately after completing surface finish.

3.6 CEMENT CONCRETE PAVEMENT

A. FLOAT FINISHING

1. General: Do not add water to concrete surfaces during finishing operations.

2. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

3. Retain one or more "Burlap Finish," "Medium-to-Fine-Textured Broom Finish," and "Medium-to-Coarse-Textured Broom Finish" subparagraphs below or revise to suit Project. If retaining more than one subparagraph, indicate locations of each on Drawings.

4. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.

5. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

6. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 BITUMINOUS ASPHALT PAVEMENT

GRAVEL SUB-BASE

A. Gravel shall be spread and compacted in layers not exceeding 8 inches in depth, except the last layer of gravel sub-base (conforming to M1.03.0 Type B) will be 4” in depth. Layers shall be compacted to 95 percent of the maximum dry density of the material as determined by Standard

AASHTO Test Designation T99 compaction test Method C at optimum moisture content as determined by the Engineer.

B. Any stone with a dimension greater than that permitted for the type of gravel specified shall be removed from the sub-base before the gravel is compacter. Compaction shall continue until the surface is true and even to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and the maximum irregularity not exceeding 3/8 inch under a 10 foot line longitudinally. In locations when 8" of gravel is used for Gravel Base Course this tolerance shall be 3/4 inch under a 10' line.

C. Any area of gravel sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.

DENSE GRADED CRUSHED STONE SUB-BASE

A. Dense graded crushed stone shall be spread and compacted in layers not exceeding 8 inches in depth, except the last layer of gravel sub-base (conforming to M1.03.0 Type B) will be 4" in depth. Layers shall be compacted to 95 percent of the maximum dry density of the material as determined by Standard AASHTO Test Designation T99 compaction test Method C at optimum moisture content as determined by the Engineer.

B. Any stone with a dimension greater than that permitted for the type of gravel specified shall be removed from the sub-base before the gravel is compacter. Compaction shall continue until the surface is true and even to the proposed lines and grades within a tolerance of 3/8 inch above or below the required cross sectional elevations and the maximum irregularity not exceeding 3/8 inch under a 10 foot line longitudinally. In locations when 8" of gravel is used for Gravel Base Course this tolerance shall be ¾ inch under a 10' line.

C. Any area of dense graded crushed stone sub-base which, after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.

RECLAIMED BASE COURSE

A. Prior to scarifying and pulverizing the existing pavement, the Contractor shall located and protect existing drainage and utility structures and underground pipes, culverts, conduits and other appurtenances. If the upper sections of the utility structures are removed to facilitate scarifying and pulverizing the existing pavement, the remaining part of the structure shall immediately be covered with a steel plate capable of withstanding a 36.5 ton truck load with impact.

B. The Contractor shall submit to the Engineer for approval a description of the equipment and the process to be used for scarifying and pulverizing the existing pavement. The pulverizing operation shall be controlled in such a manner that the resultant material will be free from excessive fine material (materials passing the No. 200 sieve) The Engineer will determine the acceptable level of fine material.

C. The bituminous pavement and underlying material shall be scarified to the depths shown on the plans or established by the Engineer and pulverized and mixed to produce a consistent homogeneous material, 100 percent passing the 3-inch sieve and without an excess of material passing the No. 200 sieve. If the Engineer directs, Gravel Borrow (type b) shall be blended with the pulverized material in quantities to be established by the Engineer to produce a blend suitable for use as a base course.

D. Unsuitable materials in the subgrade shall be removed to the lines and depths established by the Engineer and replaced with Gravel Borrow.

E. The mixed and/or blended base course material shall be spread and compacted in accordance to the requirements of Gravel Sub-Base

GRAVEL BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following: MHD Specifications Section 405, "Gravel Base Course".

B. Compaction of aggregate base course shall be to 95% of maximum density as determined by ASTM D 1557, Method D. Stone greater than 2-1/2 in. shall be excluded from course.

C. Width of base course shall be greater than the width of pavement surface, and shall extend at least 2 x base thickness beyond edge of the course above.

D. Aggregate material shall be applied in lifts less than or equal to 4 in. thick, compacted measure. Each lift shall be separately compacted to specified density.

1. Material shall be placed adjacent to wall, manhole, catch basin, and other structures only after they have been set to required grade and level.

2. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.

3. Surface irregularities which exceed 1/2 in. using a 10 ft. long straightedge shall be replaced and properly compacted.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with gravel. Materials spilled outside pavement lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

BITUMINOUS PAVING

A. Bituminous paving mixture, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base, etc., shall conform to MHD Specifications Section 460 Class I Bituminous Concrete Pavement for roadway and parking areas and Section 701 Sidewalks, Wheelchair Ramps, and Driveways for sidewalks.

B. Bituminous binder and wearing surface courses shall each be applied individually, in single lifts of full thickness indicated on the Drawings.

C. Work shall not be performed during rainy weather or when temperature is less than 40F

D. Adjacent concrete work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original condition.

E. Existing paved surfaces to be resurfaced shall be cleaned of foreign and objectionable matter with blowers, power brooms, or hand brooms immediately before applying bituminous pavement. Cracks shall be cleaned and bituminous crack sealer applied to fully seal pavement.

F. The surface of the pavement to be resurfaced shall receive a bituminous prime coat before laying bituminous binder course. Prime coat shall be applied at rate which will leave Bituminous residue of 5

to 7 gal./100 sq. yd. after evaporation of vehicle. Base surface shall be dry and clean when prime coat is applied. Bituminous paving material shall not be placed until vehicle has completely evaporated from prime coat. Adjoining new paving shall be placed before prime coat has dried or dusted over.

G. Deliveries shall be timed to permit spreading and rolling all material during daylight hours, unless artificial light, satisfactory to Landscape Architect, is provided. Loads which have been wet by rain or otherwise will not be accepted. Hauling over freshly laid or rolled material will not be permitted.

H. Placing and rolling of mixture shall be as nearly continuous as possible. Rolling shall begin as soon after placing as mixture will bear the operation without undue displacement. Delays in rolling freshly spread mixture will not be permitted. Rolling shall proceed longitudinally, starting at edge of newly placed material and proceeding toward previously rolled areas. Rolling overlap on successive strips shall be greater than or equal to 1/2 width of roller rear wheel. Alternate trips of roller shall be of slightly different lengths. Corrections required in surface shall be made by removing or adding materials before rolling is completed. Skin patching of areas where rolling has been completed will not be permitted. Course shall be subjected to diagonal rolling, crossing lines of the first rolling while mixture is hot and in compactable condition. Displacement of mixture or other fault shall be corrected at once by use of rakes and application of fresh mixture or removal of mixture, as required. Rolling of each course shall be continued until roller marks are eliminated. Roller shall pass over unprotected edge of course only when paving is to be discontinued for sufficient time to permit mixture to become cold.

I. In places not accessible to roller, mixture shall be compacted with hand tampers. Hand tampers shall weigh at least 50 lb. and shall have a tamping face less than or equal to 100 sq. in. Mechanical tampers capable of equal compaction will be acceptable in areas in which they can be employed effectively.

J. Portions of pavement courses which become mixed with foreign material or are in any way defective shall be removed, replaced, replaced with fresh mixture, and compacted to density of surrounding areas. Bituminous material spilled outside lines of finished pavement shall be immediately and completely removed. Such material shall not be employed in the work.

K. Joints shall present same texture, density, and smoothness as other sections of the course. Continuous bond shall be obtained between portions of existing and new pavements and between successive placements of new pavement. New material at joints shall be thick enough to allow for compaction when rolling. Compaction of pavement, base, and subgrade at joints shall be such that there is no yielding of new pavement relative to existing pavement when subjected to traffic.

L. Contact surfaces of previously constructed pavement (if greater than or equal to seven days since binder placed), manholes, and similar structures shall be thoroughly cleaned and painted with a thin uniform coating of bitumen immediately before fresh mixture is placed. Tack coat shall be applied at rate which will leave asphaltic residue of 5 to 7 gal./100 yd.2 after evaporation of vehicle. Base surface shall be dry and clean when tack coat is applied. Bituminous paving material shall not be placed until vehicle has completely evaporated from tack coat. Adjoining new paving shall be placed before tack coat has dried or dusted over.

M. Earth or other approved material shall be placed along pavement edges in such quantity as will compact to thickness of course being constructed, allowing at least 1 ft. of shoulder width to be rolled and compacted simultaneously with rolling and compacting surface. Pavement edge shall be trimmed neatly to line before placing earth or other approved material along edge.

N. After final rolling, vehicular traffic shall not be permitted on pavement until it has cooled and hardened, and in no case less than six hours.

O. Variations in smoothness of finished surface shall be less than or equal to the following tolerances when tested with a 10 ft. straightedge, applied both parallel to and at right angles to centerline of paved area.

1. For sidewalk pavement surface course - 1/4 in. in 10 ft.
2. At joint with existing pavement, and at other locations where an essentially flush transition is ` required, pavement elevation tolerance shall not exceed 0.01 ft.
3. At other areas pavement elevation tolerance shall not exceed + 0.05 ft.
4. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this Section for a distance of 20 feet in all directions of the irregularity.

3.08 FIELD QUALITY CONTROL

A. Provide and pay for field quality control testing and inspection. Testing Agency shall be approved by the Architect. Number and location of tests shall be as determined by the Testing Agency and the Architect during concrete operations.

B. Give adequate notice, cooperate with, provide access to the Work, obtain samples, and assist Testing Agency and its representatives in execution of their function.

C. Protection: Protect concrete work from damage until final acceptance. Exclude construction and vehicular traffic from concrete pavements for at least 14 days.

3.09 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from concrete operations.

B. Sweep concrete sidewalks and pavement, wash free of stains, discoloration, dirt, and other foreign material immediately prior to final acceptance.

END OF SECTION 32 13 13

SECTION 321640

GRANITE CURBS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

B. Examine all other sections of the Specifications 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 the Contract.

D. All work shall conform to the Town of Bedford Department of Public Works (DPW) Standards for Materials and Construction.

1.2 WORK INCLUDED

A. Provide all labor, materials, services, equipment and transportation required completing all straight and curved vertical granite curb work as shown on Drawings, as See Drawings for locations and details.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. Section 03 30 00, CAST-IN-PLACE CONCRETE

B. Section 31 00 00, EARTHWORK.

C. Section 31 25 00, EROSION AND SEDIMENT CONTROL.

D. Section 32 12 16, ASPHALT PAVING.

E. Section 32 13 13, CONCRETE PAVING.

F. Section 32 17 13, PAVEMENT MARKINGS.

G. Section 33 10 00, WATER SYSTEM.

H. Section 33 30 00, SANITARY SEWAGE SYSTEM.

I. Section 33 40 00, STORM DRAINAGE SYSTEM

1.4 SHOP DRAWINGS AND SAMPLES

A. Prepare and submit Shop Drawings in accordance with requirements of Division

B. Shop Drawings and cuts shall indicate Specification Section and Paragraph requiring items submitted.

C. Submit samples of all materials requested by the Architect for approval, in accordance with requirements of Division 1 and obtain approval before ordering materials.

D. Finished work shall conform to approved samples and Shop Drawings.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials furnished under this Section in a manner to prevent cracking or stress of components and to prevent chipping, staining, mechanical damage or damage by the elements.

B. Deliver work under this Section to site in ample time to avoid delay in job progress and at such times as to permit proper coordination of the various parts.

PART 2 - PRODUCTS

2.1 GRANITE CURB STONES

A. Curbs: Furnish and install, prior to surfacing, vertical granite curbs of hard and durable stone, conforming except as otherwise indicated to the Specifications for Type VA-4 described in Section M9.04.1 of the Massachusetts Department of Transportation – Highway Division Standard Specifications for Highways and Bridges: massDOT –Standard Specifications.

B. Vertical Curbs: Shall be Chelmsford light grey granite. Curbs shall be 18" deep plus or minus 1", 6" wide at top with front and back faces, tops and ends dressed for setting. The front and back face shall be at right angles to the plane of the top. Minimum length, 6'-0". Top and exposed faces shall be quarry face. Furnish all straight and curved pieces required to complete the Work.

C. Foundation: Shall consist of 2" minus clean porous gravel spread upon the subgrade and after being thoroughly compacted by tamping, shall be not less than 6" in depth. Trenches for curb stone shall be 18" wide.

D. Cement Mortar: Shall meet requirements of massDOT Specifications Section M4.02.15 and shall have "Natural" color to match curb color.

PART 3 - EXECUTION

3.1 GRADING AND COMPACTION OF BASE COURSE

A. Do all necessary grading in addition to that specified under EARTHWORK Section, to bring subgrade or foundation after final compaction to required grades and sections for curb installation. Tamp traces of trenches. Remove spongy and otherwise unsuitable material and replace with approved material. Loosen exceptionally hard spots and re-compact. Take every precaution to obtain a foundation of uniform bearing power. In absence of specific requirements, compact foundation by such means as will provide firm base and insurance against settlement of superimposed work.

B. Sub-base preparation, including material, shall be of proper approved quality as specified under EARTHWORK Section. Start of work under this Section shall constitute acceptance of the foundation conditions to which this work is to be applied. Any defects in work resulting from such conditions shall be corrected under this Section, at no extra cost to the Developer.

C. Maintain sub-base in satisfactory condition and properly drained until surface improvement is placed.

3.2 INSTALLATION OF CURBS

A. Installation of vertical curbs shall be in accordance with massDOT – Highway Standard Specifications Section 501. Installation of edging shall be in accordance with massDOT – Standard Specifications Detail 106.5.0.

B. Setting: Curb shall be set to lines and grades required. Additional gravel shall be spread upon the foundation if required, and the curb set thereon. All spaces under the curb stones shall be filled and all stones shall be completely supported throughout their length. Subgrade of trenches for curbing shall be 12" below bottom of curb where concrete foundation is required. Ends of stones shall be not less than 1/4" nor more than 1/2" apart at any joint in the exposed faces.

C. Pointing: Joints between curb stones shall be carefully filled with light grey cement mortar and neatly pointed on the top and exposed faces. Mortar shall be composed of equal parts of cement and sand with sufficient water to form a workable mixture. After pointing, clean off all excess mortar and tool joints slightly below adjacent stone surfaces as approved by the Developer.

END OF SECTION

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SECTION 321713

PAVEMENT MARKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.

B. Examine all other Sections of the Specifications and drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section or implied on the drawings.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. All work shall conform to the Town of Bedford Department of Public Works (DPW) Standards for Materials and Construction.

1.2 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment, services and transportation required to install pavement markings as shown on Drawings, as specified herein, or both.

B. Perform all work of the Section, as indicated. Such work includes, but is not limited to, the following:
   1. Installing reflectorized pavement markings including parking lines, striping, and traffic arrows as indicated on the drawings.

1.3 RELATED WORK UNDER OTHER SECTIONS

A. Section 32 12 16, ASPHALT PAVING.

1.4 REFERENCES

A. Work shall conform to codes and standards of the following:
   1. Massachusetts Department of Transportation – Highway Division Standard Specifications for Highways and Bridges: massDOT – Highway Standard Specifications.
   2. U.S. Department of Transportation Federal Highway Administration "Manual on Uniform Traffic Control Devices", 2003 Edition.

1.5 SUBMITTALS

A. Product Data: Submit supplier's certificate of conformance.

B. Test Reports: Submit test reports for required performance.

C. Layout: Furnish layout computations.

1.6 QUALITY ASSURANCE

A. Source: Provide the products of one manufacturer and source for consistency.

B. Standards: Conform to all requirements of the U.S. Department of Transportation Federal Highway Administration "Manual on Uniform Traffic Control Devices", 2003 Edition (herein after referred to as MUTCD), together with all issued errata, addenda, additions, revisions and supplemental specifications. Conform to all requirements of the latest ADA and MAAB standards for handicap parking.

1.7 LAYOUT OF WORK

A. The Contractor shall furnish to the Architect for approval a schedule of pavement marking operations in accordance with massDOT – Highway Standard Specifications Section 860.61.

1.8 TRAFFIC CONTROL

A. Suitable warning signs shall be placed near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions.

B. Place traffic cones along newly painted lines to control traffic and prevent damage to newly painted surfaces. Remove when paint has dried fully.

C. Painting equipment shall be marked with large warning signs indicating slow moving painting equipment in operation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials for pavement markings shall conform to massDOT – Highway Standard Specifications Section 860.40 as applicable.

B. Pavement Markings: Provide white or yellow paint conforming to Section M7.01.5 or M7.01.6 in massDOT – Highway Standard Specifications. Color to be approved by the Architect.

C. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's

name, formulation number and directions, all of which shall be plainly legible at time of use.

D. Paint shall be homogeneous, easily mixed to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months

2.2 MARKING EQUIPMENT

A. Machines, tools and equipment used in the application of pavement markings shall conform to massDOT – Highway Standard Specifications Section 860.60.

B. Push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking roadway and parking areas. Applicator machine shall have the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

C. Sandblasting equipment shall be provided as required for cleaning surfaces to be painted. Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required. Compressor shall be capable of furnishing not less than 150 cfm of air at a pressure of not less than 90 psi at the nozzle for each nozzle used.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. New pavement surfaces shall be allowed to cure for a period of not less than 48 hours before application of marking materials.

B. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods, as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed using scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion, as directed.

C. Where oil or grease are present on old pavements to be marked, affected areas shall be scrubbed with several applications of tri-sodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil- soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint.

3.2 APPLICATION

A. Pavement markings shall be white or as approved by the Architect.

B. Pavement markings shall be placed as shown on Layout Plan.

C. Marking materials shall be applied to clean, dry surfaces in accordance with the requirements of massDOT – Highway Standard Specifications Section 860.62.

D. Paint shall be applied pneumatically with approved equipment.

E. Pavement marking materials shall be applied evenly to the pavement surface to be coated at a rate specified in massDOT – Highway Standard Specifications Section 860.62.

F. Guidelines and templates shall be employed as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols.

G. Edges of markings shall be sharply outlined.

H. Maximum drying time requirements of the paint manufacturer shall be enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by vehicle tires.

I. If markings require more drying time than stated by the paint manufacturer, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

3.3 PROTECTION OF MARKINGS

A. Markings shall remain protected in accordance with massDOT – Highway Standard Specifications Section 860.63.

3.4 GUARANTEE

A. Contractor is to furnish the Owner with a one (1) year unconditional guarantee against fading, chipping, peeling, wearing, etc. The Contractor is to provide said guarantee in writing, in a form acceptable to the Developer. If said guarantee is not in an acceptable form, the Contractor will have (10) days after receipt of notice from the Developer to correct the form.

END OF SECTION

SECTION 32 90 00
EXTERIOR PLANTING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Include GENERAL CONDITIONS and applicable part of Division 1 as part of this Section.

B. Examine all other Sections of the Specifications for requirements that 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 the Contract.

D. The Landscape Architect shall inspect and tag the specified plant materials at the source(s) of growth as selected by the Contractor. The cost for inspection and tagging shall be borne by the Contractor. The portal–to-portal hourly rate charged by the Landscape Architect for this service shall be $150. Mileage and other associated travel expenses will also be borne by the Contractor at cost plus 10%.

1.2 WORK INCLUDED

A. Provide trees, shrubs, and ground covers as shown and specified. The work includes:

1. Trees, shrubs, ground covers, and ornamental grasses
2. Planting media
3. Mulch and planting accessories
4. Maintenance
5. Fertilizer

B. Irrigation System: Provide a permanent drip irrigation system to accommodate the needs of all proposed trees, shrubs, and ground covers on the project.

1.3 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:

1. Massachusetts Highway Department's *Standard Specifications for Highways and Bridges*, 1988 (MHD).
2. American Association of Nurserymen, "American Standard for Nursery Stock", 1992.

B. Plant names indicated comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally to names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.

C. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock." Each plant shall be dimensioned as it stands in its natural position.

D. All plants shall be nursery grown under climatic conditions similar to those in the locality of the project for a minimum of 2 years.

E. Stock furnished shall be at least the minimum size indicated. Larger stock may be planted at no additional cost to the Owner, provided that larger plants are not cut back to size indicated, and that such plants are acceptable to the Landscape Architect.

F. Plants may be inspected and approved by the Landscape Architect at the place of growth for compliance with specification requirements for quality, size, and variety. However, such approval shall not impair the right of inspection and rejection upon delivery at the site or during the progress of the Work.

G. Provide and pay for material testing. Test representative material samples proposed for use. Testing agency shall be acceptable to the Landscape Architect. Provide the following data:

1. Topsoil:
   a. pH factor
   b. Mechanical analysis
   c. Percentage of organic content
   d. Recommendation of type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to a satisfactory level for planting.

2. Peat Moss:
   a. Loss of weight by ignition.
   b. Moisture absorption capacity.

1.4 RELATED WORK UNDER OTHER SECTIONS

A. Section 32 13 13- Pedestrian Concrete Pavement

B. Section 32 90 00- Site Improvements

1.5 SUBMITTALS

A. In addition to samples for testing, submit samples of the following materials:

1. Mulch
2. Planting accessories

B. Submit certification of the following materials:

1. Topsoil source and pH value
2. Peat moss
3. Plant fertilizer

C. Submit material test reports.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver fertilizer materials in original, unopened and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.

B. Take all precautions customary in good trade practice in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved anti-desiccant immediately after digging to prevent dehydration. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock and on arrival. These certificates shall be filed with the Landscape Architect. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in other manner acceptable to the Landscape Architect. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches.

C. Cover plants transported on open vehicles with a protective covering to prevent windburn.

D. Provide dry, loose topsoil for planting bed mixes. Frozen or muddy topsoil is not acceptable.

1.7 WARRANTY FOR PLANTS

A. Warrant plant material to remain alive and be in healthy, vigorous condition for period of one (1) year after completion and acceptance of planting. Inspection of plants will be made by the Landscape Architect at completion of planting work as provided below.

B. Replace in accordance with the Drawings and Specifications all plants that are dead or, as determined by the Landscape Architect, are in an unhealthy or unsightly condition. Replace plants that have lost their natural shape due to dead branches or other causes resulting from activities under this Section. Such replacement(s) shall be at no additional expense to the Owner. Warrant all replacement plants for one (1) year after installation.

C. Warranty shall not include damage or loss of plants caused by fires, floods, freezing rains, lightning storms, or winds over 75 miles per hour, winter kill caused by extreme cold and severe winter conditions not typical of planting area, acts of vandalism or negligence on the part of the Owner.

D. Remove and immediately replace all plants as determined by the Landscape Architect to be unsatisfactory during the initial planting installation.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. Plants: Provide plants typical of their species and variety with normal, densely developed branches and vigorous, fibrous root systems. Provide only sound, healthy, vigorous plants free from defects, disfiguring knots, sun scald injuries, frost cracks, abrasions of the bark, plant diseases, insect eggs, borers, and all form of infestation. All plants shall have a fully developed form without voids and open spaces. Plants held in storage will be rejected if the show signs of growth during storage.

B. Dig balled and burlapped plants with firm, natural balls of earth of sufficient diameter and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock." Cracked or mushroomed balls are not acceptable.

C. Provide shade tree species that mature at heights of 25'-0" or more with a single main trunk. Trees that have the main trunk forming a "Y" shape are not acceptable. All trees shall provide 6' of clear trunk (finish grade to first branch)

D. Trees planted in rows shall match in form.

E. Trees larger than those specified in the plant list may be used when acceptable to the Landscape Architect.

F. The height of the trees, measured from the crown of the roots to the top of the top branch, shall not be less than the minimum size designated in the plant list.

G. No pruning wounds shall be present with a diameter of more than 1", and such wounds shall show vigorous bark on all edges.

2.2 ACCESSORIES

A. Topsoil for Planting Beds: Fertile, friable, natural topsoil of loamy character, without admixture of subsoil material, obtained from the site, free from clay, lumps, coarse sands, stones over one inch, plants, roots, sticks, and other foreign materials with acidity range of between pH 6.0 and 6.8.

B. Peat Moss: Brown to black in color, weed and seed free granulated raw peat or baled peat, containing more than 9% mineral on a dry basis.

C. Fertilizer: Commercial type approved by the Landscape Architect, containing 12% nitrogen, 12% phosphoric acid, and 12% potash by weight. 25% of nitrogen shall be in the form of nitrates, 25% in form of ammonia salt, and 50% in form of organic nitrogen.

D. Anti-Desiccant: Shall be a film emulsion providing a protective film over plant surfaces. It shall be permeable to permit transpiration. Mix and apply in accordance with manufacturer's instructions.

E. Mulch: Native Hemlock nugget mulch not larger than 2" in length and 1/2" in width, free of wood chips and sawdust, Natural in color. Shredded bark will not be acceptable.

F. Water: Free of substances harmful to plant growth. Contractor shall furnish hoses or other methods of transportation.

G. Stakes for Staking: Hardwood, 2" x 2" x 8'-0" long.

H. Stakes for Guying: Hardwood 2" x 2" x 36" long.

I. Guying/Staking Wire: NO. 10 or 12 gauge galvanized wire.

J. Turnbuckles: Galvanized steel of size and gauge required to provide tensile strength equal to that of the wire. Turnbuckle openings shall be at least 3".

K. Staking and Guying Hose: Two-ply, reinforced garden hose not less than 1/2" inside diameter.

L. Tree Wrap: Standard waterproofed tree wrapping paper, 1-1/2" wide, made of 2 layers of crepe kraft paper weighing not less than 30 lbs. per ream, cemented together with asphalt.

M. Twine: Two-ply jute material.

2.3 SAND BASED STRUCTURAL SOIL (SBSS)

A. A uniformly blended urban tree mixture of sand and clay loam shall be mixed in the following proportion:

	Material	Unit of Weight
a.)	specified crushed stone	90 units dry weight
b.)	specified clay loam	10 units 0
c.)	moisture	ASTM D698/AASHTO T-99 optimum

PART 3 - EXECUTION

3.1 PROJECT CONDITIONS

A. Work notification: Notify Landscape Architect at least seven (7) working days prior to installation of plant material.

B. Protect existing utilities, paving and other facilities from damage caused by landscaping operations.

C. A complete list of plants, including a schedule of sizes, quantities, and other requirements is provided on the Drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.

D. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Time of Planting:

1. Deciduous Material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti desiccant prior to planting operation.
2. Planting times other than those indicated shall be only those authorized by the Landscape Architect.

B. Planting shall be performed only by experienced workmen familiar with planting operations until alternate plant locations have been selected, or obstructions removed under another Section.

C. Locate plants as indicated or as approved in the field after staking by the Contractor. If obstructions are encountered that are not shown on the Drawings, do not proceed with planting operations until alternate plant locations have been selected, or obstructions removed under another Section.

D. Excavate circular plant pits with vertical sides, except for plants specifically indicated to be planted in beds. Provide shrub pits at least 12" greater than the diameter of the root system and 24"

greater for trees. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 4". Remove excavated materials from the site.

E. Provide pre-mixed planting mixture for use around the balls and roots of the plants consisting of 5 parts planting topsoil to 1 part peat moss and 1/2 lb. plant fertilizer for each cubic yard of mixture.

3.3 PLANTING OPERATIONS

A. Set plant material in the planting pit to proper grade and alignment. Set plants upright, plumb, and faced to give the best appearance or relationship to each other and adjacent structure. Set plant material 1"-2" above the finish grade. No filling will be permitted around trunks or stems. Backfill the pit with planting mixture. Do not use frozen or muddy mixtures for backfilling. Form a ring of soil around the edge of each planting pit to retain water.

B. After balled and burlap plants are set, muddle planting soil mixture around base of balls and fill all voids. Remove all burlap, ropes, and wires from the top third of the root balls.

C. Mulching for woody plants:

1. Mulch trees and shrubs planting pits and shrub beds with required mulching material 2" deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.

D. Wrapping:

1. Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
2. Wrap trunks of trees spirally from bottom to top with specified tree wrap and secure in place.
3. Overlap 1/2 of width of the tree's wrap strip and cover the trunk from the ground to the height of the second branch.
4. Secure tree wrap in place with twine wound spirally downward in opposite direction, tied around the tree in at least 3 places in addition to the top and bottom.

E. Staking

1. Stake all trees immediately after planting operations and prior to acceptance.
2. Stake all trees, regardless of caliper, to avoid tripping hazards.
3. Use three (3) stakes per tree except as otherwise approved.

F. Pruning:

1. Prune branches of deciduous stock after planting, to balance the loss of roots and preserve the natural character appropriate to the particular plant requirements. In general, remove 1/4 to 1/3 of the leaf bearing buds; proportion shall in all cases be acceptable to the Landscape Architect. Remove or cut back, broken, damaged, and unsymmetrical growth of new wood.
2. Multiple Leaders Plants: Preserve the leader that will best promote the symmetry of the plant. Cut branches flush with the trunk or main branch at a point beyond a lateral shoot or bud a distance of not less than 1/2 the diameter of the supporting branch. Make cut on an angle.
3. Prune evergreens only to remove broken or damaged branches.

G. All work shall be acceptable to the Landscape Architect.

3.10 MAINTENANCE

A. Maintain planting until completion and acceptance of the planting installation.

B. Maintenance shall include pruning, cultivating, weeding, watering, and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.

C. Re-set settled plants to proper grade and position. Restore planting saucer and adjacent material and remove dead material.

D. Tighten and repair guy wires and stakes as required.

E. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.

F. Water trees, plants, and ground cover beds within the first 24 hours of initial planting, and not less than twice per week until final acceptance.

3.12 ACCEPTANCE FOR WOODY PLANTS

A. All planting will be inspected by the Landscape Architect at completion of installation for compliance with specified materials and installation requirements.

B. Inspection to determine acceptance of planted areas will be made by the Landscape Architect upon Contractor's request. Provide notification at least ten (10) working days before requested inspection date.

C. Planted areas will be accepted provided all requirements including maintenance, have been complied with the plant materials are alive and in a healthy vigorous condition.

D. Upon acceptance, the Owner will assume plant maintenance.

3.13 CLEANING

A. Perform cleaning during installation of work and upon completion of work.

B. Remove from site all excess material, soils, debris and equipment.

C. Repair damage resulting from planting operations.

END OF SECTION 32 90 00

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SECTION 32 90 05

SEEDED GRASSES AND WILDFLOWERS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.

B. Examine all other Sections of the Specifications for requirement 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 the Contract.

1.02 WORK INCLUDED

A. Provide lawn grass, meadow grass, and wildflowers as shown and/or specified. The work includes:

1. Topsoil distribution and finish grading.
2. Soil preparation.
3. Soil testing
4. Hydroseeding lawn grass in disturbed areas.
5. Hydrseeded shade mix wild flowers at slope by building addition
5. Warranty for lawn grass wildflowers.

B. Provide a uniform stand of grass by watering and maintaining seeded areas until final acceptance. Re-seed areas, with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Landscape Architect.

C. Provide hose and lawn watering equipment as required.

D. All disturbed areas of the site not indicated to be developed otherwise shall be planted to grass.

1.03 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with applicable sections of the Massachusetts Highway Department, *Standard Specifications for Highways and Bridges*, 1988 (MHD).

B. Provide and pay for materials testing. Test representative material samples proposed for use. Testing agency shall be acceptable to the Landscape Architect. Provide the following data for all topsoil:

1. pH factor.
2. Mechanical analysis.
3. Percentage of organic content.
4. Percentage on type and quantity of additives required to establish satisfactory pH factor and supply of nutrients to bring nutrients to satisfactory level for planting.

C. Grass seed mixes shall be provided by:

Prairie Nursery, PO. Box 306, Westfield, WI; 800-476-9453
Ernst Conservation Seeds, 9006 Mercer Pike, Meadville, PA; phone 814-336-2404
New England Wetland Plants, Inc., 820 West Street, Amherst, MA; phone 413-548-8000
or equal as approved by the Landscape Architect.

D. Wildflower mix shall be by Prairie Moon Nursery www.prariemoon.com, or approved equal.

1.04 SUBMITTALS

A. Submit seed vendor's certification for required grass seed mixture, indicating percentage by weight and percentage of purity, germination, and weed seed for each grass species.

B. Submit fertilizer analysis certification.

C. Submit materials test reports.

D. Prior to lawn acceptance, submit to the Landscape Architect written maintenance instructions recommending procedure for maintenance of seeded lawns.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed and fertilizer materials in original unopened containers, showing weight, analysis, and name of manufacturer. Store in a manner to prevent wetting and deterioration.

B. Deliver materials in time to avoid delay in the Work.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. Topsoil stripped and stockpiled on the site under SITE PREPARATION Section may be used provided that, after testing and addition of necessary additives, it meets the following specifications. Provide under this Section all additional loam required to obtain the volume called for on the Drawings.

B. Provide all additional topsoil required for the work of this Section from approved off-site sources. Review geotechnical investigations and other such reports and determine the quantity of topsoil required for completion of work under this Section. Provide topsoil for seeding of all disturbed areas within or outside the Limit of Work line.

C. Topsoil: Shall be a natural friable, fertile soil characteristic of productive soils in the vicinity. It shall be of uniform composition, without admixture of subsoil. It shall be free of stones greater than one inch, lumps, plants and their roots, debris, clay and other extraneous matter. It shall not contain toxic substances harmful to plant growth. It shall not contain toxic substances harmful to plant growth. It shall be obtained from naturally well drained areas which have never been stripped before and have a history of satisfactory vegetative growth.

D. Topsoil shall have an acidity range of pH 5.8 to pH 7.0 and shall contain not less than 4% nor more than 20% organic matter as determined by the loss of ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of 2300° F plus or minus 9 degrees.

E. Make any and all additions to or amendments of topsoil as required to remedy any deficiency shown in these tests.

F. No topsoil shall be delivered in a frozen or muddy condition.

2.02 DISTURBED AREA SEED MIX

A. Shall be a blend of six “bunch forming” and “creeping” Fescues derived from species that are native to the Northern Hemisphere. The blend shall consist of the following types:

Botanical Name	**Common Name**	**Percentage**	**Germination**
Festuca commutata	Longfellow Chewings Fescue	24.73%	85%
Festuca ovina	Sheep Fescue	23.42%	85%
Festuca rubra ‘Shoreline’	Shoreline Slender Creeping Red Fescue	12.89%	85%
Festuca brevipila ‘Chariot’	Chariot Hard Fescue	12.83%	85%
Festuca rubra, subsp. ‘Rubra’	Navigator Creeping Red Fescue	12.54%	85%
Festuca brevipila ‘Heron’	Heron Hard Fescue	11.76%	85%

B. Seed mixture shall be fresh, clean, new crop seed. Seed shall be provided pre-mixed by the dealer. Furnish to the Landscape Architect the dealer's guaranteed statement of the mixture and the percentage of purity and germination of each variety.

2.03 SHADY SLOPE WILD FLOWER MIX

A. The following Prairie Moon Nursery Shady Woodland seed mix shall be hydroseeded at slope as indicated on the drawings:

1) Wild Blue Phlox, Bishop's Cap and Columbine. 2) Wild Geranium, Columbine and Solomon's Plume. 3) Dutchman's Breeches and Virginia Bluebells. 4) Jacob's Ladder, Jack-in-the-Pulpit, Wild Geranium, and Early Meadow Rue. Late-summer and Fall bloomers include (photo 5) Short's Aster and Zig Zag Goldenrod. 6) Tall Bellflower and Sweet Joe Pye Weed.

2.04 TOPSOIL ADDITIVES AND OTHER MATERIALS

A. Compost: Shall be mature, stable, weed free, and produced by aerobic decomposition of organic matter. Compost feedstock may include, but is not limited to: agricultural, food or industrial residuals; class A biosolids as defined in the EPA CFR Title 40, Part 503; yard trimmings, or source-separated municipal solid waste. The product must not contain any visible refuse or other physical contaminants, substances toxic to plants, or over 5% sand, silt, clay or rock material by dry weight. The product shall possess no objectionable odors. The product must meet all applicable USEPA CFR, Title 40, Part 503 Standards for Class A biosolids. The moisture level shall be such that no visible water or dust is produced when handling the material.

B. Commercial Fertilizer: Shall be complete fertilizer and shall be a standard product complying with State and United States fertilizer laws. Fertilizer shall be delivered to the site in original unopened containers which shall bear the manufacturer's name and guaranteed statement of analysis.

At least 50 percent by weight of the nitrogen content of the fertilizer shall be derived from organic materials. Fertilizer shall be a slow-release fertilizer with equal portions of nitrogen, phosphorus, and potassium by weight of ingredients or as otherwise indicated by topsoil test results. NOTE: Fertilizer shall **not** be used in conjunction with the disturbed area seed mix unless recommended by soil testing.

C. Superphosphate: Shall be finely ground phosphate rock as commonly used for agricultural purposes and shall contain not less than 18 percent available phosphoric acid.

D. Ground Limestone: Shall be dolomitic limestone, shall contain not less than 85 percent of total carbonates and magnesium; and shall be ground to such fineness that 50 percent will pass a 100 mesh sieve and 90 percent will pass through a 20 mesh sieve. Coarser material will be accepted provided the specified rates of application are increased proportionately on the basis of quantities passing the 100-mesh sieve.

E. Commercial Fertilizer: Shall be complete fertilizer and shall be a standard product complying with State and United States fertilizer laws. Fertilizer shall be delivered to the site in original unopened containers which shall bear the manufacturer's name and guaranteed statement of analysis. At least 50 percent by weight of the nitrogen content of the fertilizer shall be derived from organic materials. Fertilizer for lawn areas shall contain not less than 10 percent nitrogen, 6 percent phosphorus, and 4 percent potash by weight of ingredients or as otherwise indicated by topsoil test results.

F. Water: Will be furnished by the Owner at existing hydrants, and shall be suitable for irrigation and free from ingredients harmful to plant life. Hose and all other watering equipment required for the work shall be furnished under this Section.

PART 3 - EXECUTION

3.01 PROJECT CONDITIONS

A. Work notification: Notify Landscape Architect at least seven (7) working days prior to start of seeding operations.

B. Protect existing utilities, paving, and other facilities from damage caused by seeding operations.

C. Perform seeding work only after planting and other work affecting ground surface has been complete.

D. Restrict traffic from lawn areas until grass is established. Erect signs and barriers as required.

E. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.02 HERBICIDE TREATMENT

A. Treat all disturbed areas scheduled for the seeding of lawn with Glyphosate (N-(phosphonomethyl) glycine. Wait ten days after herbicide treatment before commencing with seeding operations.

3.03 FINISH GRADING

A. Uniformly distribute and spread topsoil over scarified subgrade. Provide 6" minimum average depth at lawn areas. Provide all topsoil as required to complete the work. Use loose, dry topsoil. Do not use frozen or muddy topsoil. Place during dry weather.

B. Fine grade topsoil eliminating rough and low areas to ensure positive drainage. Maintain levels, profiles, and contours of subgrades. Set sufficient grades stakes to insure correct line and grade of finished work.

C. Remove stones, roots, weeds, and debris while spreading topsoil materials. Rake surface clean of stones 1/2" or larger in any dimension and all debris. Provide surfaces suitable for seeding and planting work.

3.04 SURFACE MAINTENANCE

A. Protect finish graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and damaged areas.

B. Where completed areas are disturbed by construction operations or adverse weather, scarify, re-shape, and compact to required density.

3.05 PREPARATION FOR HYDROSEEDING AREAS

A. Limit preparation to areas which will be immediately seeded. All areas within the Contract limit of work line not required to be developed otherwise shall be planted as lawn.

B. Loosen topsoil of lawn areas to minimum depth of 4". Remove stones over 1/2" in any dimension and sticks, roots, rubbish, and extraneous matter.

C. Grade areas to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.

D. Apply, limestone, at rate determined by the soil test, to adjust pH of topsoil to not less than 5.8 nor more than 7.0.

E. Apply fertilizer to indicated hydroseeded areas at a rate determined by soil test for a fescue lawn.

F. Apply fertilizer by mechanical rotary or drop type distributor, thoroughly and evenly incorporated with soil to depth of 3" by disking or other approved method. Fertilize areas inaccessible to power equipment with hand tools and incorporate into soil.

G. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to seeding.

3.07 HYDROSEEDING

A. All open areas to receive seeding may be hydroseeded at the discretion of the Contractor. However, the Contractor shall take strict precautions to avoid applying the hydroseed mixture on pavements, planting beds, or other site areas not intended to be seeded to lawn.

B. Application of grass seed and wildflower mix shall be accomplished in one operation by use of an approved spraying machine.

C. Materials shall be mixed with water in the machine and kept in an agitated state so that the materials are uniformly suspended in the water.

D. Prior to the start of work, furnish the Landscape Architect for approval a certified statement as to the number of pounds of materials to be used per 100 gallons of water, and the number of square feet to be covered with the quantity of solution in the hydroseeder. Minimum application rates shall be as follows:

   Seed Mix: 5.0 pounds per 1,000 sq. ft, or 22 pounds per acre.
   Fertilizer: 18 to 30 pounds per 1,000 sq. ft., per recommendations up soil analysis
   Lime: 45 to 90 pounds per 1,000 sq. ft., per recommendations of soil analysis

E. The hydraulic seeding and fertilizing machine shall be completely flushed and cleaned each day before seeding is started, and shall also be thoroughly flushed of all residue after the completion of application on every 10 acres.

F. If the results of the hydroseeding operations are unsatisfactory, the Contractor will be required to abandon this method and supply the materials in accordance with the dry method specified above.

G. When the hydraulic method is used, compaction or rolling will not be required.

H. Except as provided above, unless mulch material required is applied during the seeding operation or within 1/2 hour following the seeding operation, temporary and satisfactory measures to protect the seed from sunlight and heat shall be taken, such as use of a light brush drag over the seeded areas to stir the seed into the soil. Care shall be taken not to carry the seed ahead.

3.08 MAINTENANCE

A. Maintain seeded lawn areas, including watering, spot weeding, applications of herbicides, fungicides, insecticides, and re-seeding until a full, uniform stand of grass free of weeds, undesirable grass species, disease, fungus, and insects is achieved and accepted by the Landscape Architect.

B. Water daily to maintain adequate surface soil moisture for proper seed germination. Continue daily watering for not less than 30 days. Thereafter apply 1/2" of water twice weekly throughout the first two growing seasons until acceptance for all rain garden meadow grass seeds and plugs. After the first 30 days, the “Disturbed Area” seed mix must be watered on an as-needed basis during times of unusually dry or hot weather.

C. Repair, re-work, and re-seed all areas that have washed out, are eroded, or do not catch.

D. Do not mow lawn areas intended to receive the disturbed area seed mix unless directly to by the Landscape Architect, and in no case do any mowing until lawn areas reach 3” in height.

3.09 ACCEPTANCE

A. Inspection to determine acceptance of seeded lawns will be made by the Landscape Architect upon Contractor's request. Provide notification at least ten (10) working days before requested inspection date.

B. Seeded areas will be acceptable provided all requirements, including maintenance, have been complied with, and a healthy uniform, close stand of specified grass is established free of weeds, undesirable grass species, disease, fungus, and insects.

C. No individual lawn areas shall have bare spots or unacceptable cover totaling more than 2% of the areas requested to be inspected.

D. Owner will assume lawn maintenance upon acceptance.

3.10 CLEANING

A. Perform cleaning during installation of the work and upon completion of the work.

B. Remove from site all excess materials, debris, and equipment.

C. Repair damage resulting from seeding operations.

END OF SECTION

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SECTION 32 90 12
RELOCATED PLAY EQUIPMENT
ADD ALTERNATE No. 2

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Include GENERAL CONDITIONS and applicable parts of Division 1 as part of this Section.

B. Examine all other Sections of the Specifications for requirements that affect work under this Section whether or not such work is specifically mentioned in this Section.

1.2 WORK INCLUDED

A. The work includes:

1. Disassemble and Reinstall Play Equipment at new location on site

B. See Drawings for locations and details.

1.3 QUALITY ASSURANCE

A. Materials and methods of construction shall comply with the following standards:

1. American Society for Testing and Materials, (ASTM).
2. Massachusetts Highway Department (DOT) Standard Sopecifications for Highways and Bridges, 1988 Edition; herein refered to as the DOT Standard Specification.

1.4 RELATED WORK UNDER OTHER SECTIONS

A. Section 32 13 13- Pedestrian Pavement
B. Section 32 90 00- Exterior Planting
C. Section 32 90 05- Seed and Wildflower Mix

1.5 SUBMITTALS / SELECTIONS

A. Shop Drawing

1. Shop Drawings: Submit measured shop drawings of all componets of existing play equipment along with color photographs taken from each of the four cardinal points for review by the Landscape Architect.

B. Provide sample and certificate of wood chip safety surcaing

PART 2- PRODUCTS

1.1 EXISTING PLAY EQUIPMENT

A. Removed and securely stockpiled

B. Fasteners for reassembly shall be new stainess steel to match original with neoprene washers.

1.2 CONCRETE FOOTING

A. Shall be 4,000 psi design compressive strength 5-7% air-entrained concrete conforming to requirements of Section M4 of the Standard Specification.

1.3 EXISTING RUBBER EDGING

A. Removed and securely stockpiled

1.4 WOOD CHIP SAFETY SURFACE

A. Shall be Engineered Wood Fiber, that passes the ASTM F2075 Engineered Wood Fiber Standard.

PART 3 - EXECUTION

3.1 DISASSEMBLE EXISTING PLAY EQUIPMENT

A. Contractor shall use hand tools to remove composet panels, slides, planks and other elements, being careful not to cut or scrape the pieces, and place in secure storag.

B. Use ropes and or soft strap belts, the Contractor shall remove metal posts from existing settings being careful not to strap existing painted surfaces, and place in secure storgae.

3.2 REASSEMBLE PLAY EQUIPMENT

A. With proposed locations of metal posts marked by wood stakes that are based on the measured shop drawing of the existing layout, the Concrator shall excavate out soil in order to place the pots footing so the the pasts are at the correct height to accommodate component reattachments.

B. In the event the existing concrete footings are not attached to bottoms of post, pour concrete footing making sure that post is in true and plumb alignment.

C. Reattached components to posts using new stainless steel fasteners.

3.3 RUBBER EDGING

A. Install salvages rubber edging as shown on the Drawings.

3.4 WOOD SAFETY SURFACE

A. install engineered wood fibers as shown on the Drawings following manufactuer;s written instructions.

END OF SECTION 32 21 00

SECTION 334000

STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

B. Examine all other Sections of the Specifications for requirements, which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. All work shall conform to the Town of Bedford Department of Public Works (DPW) Standards for Materials and Construction.

1.2 TOWN OF BEDFORD DEPARTMENT OF PUBLIC WORKS (DPW)

A. The Contractor shall notify DPW sufficiently in advance of connecting new main to existing main. All work and materials shall be subject to approval by the DPW and shall conform to the applicable Town Specifications.

B. The Contractor shall be responsible for making all arrangements with the Town and paying all fees associated with the water system installation.

1.3 WORK INCLUDED

A. Furnishing and installing storm drainage lines, structures, etc. beyond 10 (ten) feet from the foundation and connecting these lines that are included under the mechanical work.

1.4 RELATED WORK

A. Section 03 30 00, CAST-IN-PLACE CONCRETE.

B. Section 31 00 00, EARTHWORK.

C. Section 31 25 00, EROSION AND SEDIMENT CONTROL.

D. Section 33 10 00, WATER SYSTEM.

E. Section 33 30 00, SANITARY SEWAGE SYSTEM

1.5 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO):

B. American Concrete Pipe Association (ACPA):

C. Concrete Pipe Design Manual

D. American Society for Testing and Material (ASTM):

C 55	Concrete Building Brick
C 62	Building Brick (Solid Masonry Units Made from Clay or Shale)
C 140	Sampling and Testing Concrete Masonry Units
C 270	Mortar for Unit Masonry
C 443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
C 564	Rubber Gaskets for Cast Iron Soil Pipe and Fittings
D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.5-kg) Rammer and 18-in. (457-mm) Drop
D 2487	Soils for Engineering Purposes
F 405	Heavy Duty Tubing
F 667	Heavy Duty Tubing

E. Federal Specifications (Fed. Spec.):

QQ-A-200/8	Aluminum Alloy Bar, Rod, Shapes, Tube and Wire, Extruded, 6061
SS-C-153	Cement, Bituminous, Plastic

F. MassDOT- Highway

Massachusetts Department of Transportation – Highway Division Standard Specifications for Highways and Bridges: massDOT – Highway Standard Specifications latest Edition

G. Town of Bedford Department of Public Works (DPW) – Standards and Specifications

1.6 SUBMITTALS

A. Manufacturer's product data:

Castings
All Precast Structures
Drywell
Grout
Cement Concrete
PVC Piping
Washed Stone

PART 2 - PRODUCTS

2.1 MANHOLES AND CATCH BASINS

A. Drain manholes and catch basins shall be precast concrete or concrete unit masonry construction, at the Contractor's option and as permitted by the DPW.

B. Precast concrete manholes and catch basins shall conform to ASTM C 478, and shall be similar to those manufactured by:

Concrete Systems, Inc., Hudson, NH.
Chase Precast Corp., North Brookfield, MA
Superior Concrete Co., Auburn. ME
E.F. Shea New England Concrete Products., Wilmington, MA
or approved equal.

1. Sections shall have tongue and groove joints.
2. Joints between sections shall be made with preformed butyl rubber joint sealant conforming to ASTM C 990.
3. Each section shall have no more than two suitable lifting holes or cast-in lifting devices.
4. Precast base shall be manufactured with wall openings to receive the ends of pipes, which are to be connected to structure.
5. Pipe openings in base shall be minimum size required to receive pipe, and shall be accurately set to conform to the required line and grade.
6. Drain pipe shall be joined to wall of concrete manhole or catch basin with nonshrink grout or flexible manhole sleeve, at the Contractor's option.

C. Manholes and catch basins shall be designed to safely withstand an AASHTO HS-20 loading, as specified in the AASHTO Specifications.

D. Concrete unit masonry manholes and catch basins.
1. Block for concrete unit masonry manholes and catch basins shall be machine-made solid concrete masonry units, conforming to ASTM C 139. Block shall be manufactured with Type II cement.
2. Sampling and testing of units shall conform to ASTM C 140.
3. Units shall be manufactured by a company approved by the Architect.
4. Radial units shall be 6 in. thick.

5. Barrel units shall be 6 in. high and batter units 8 in. high, measured in the vertical direction with blocks in place in the wall.
6. Batter blocks shall reduce inside diameter of manhole or catch basin by 6 in. per course.
7. Moisture content of concrete masonry units at time of delivery shall be less than or equal to 30% of total absorption when tested in accordance with ASTM C 140.
8. Manhole steps shall be extruded aluminum, conforming to Fed. Spec. QQ-A-200/8, or Polypropylene plastic reinforced with 3/8 in. diameter steel rod, as manufactured by:

   M. A. Industries, Inc., Peachtree City, GA
   Aluminum Company of America, Pittsburgh, PA
   New Jersey Aluminum Co., New Brunswick, NJ
   or approved equal.

9. Steps shall be drop-front, anti-skid design, 12 in. wide. Projection of front edge of step shall be greater than or equal to 5 in. from access riser wall.
10. Steps shall be embedded 3-1\2 in. into access riser and dosing tank wall. Those portions of steps to be embedded in access riser wall shall receive a heavy coat of heavy-bodied bituminous paint. Coating shall be thoroughly dry before steps are embedded in the access riser or dosing tank wall.
11. Steps in precast sections shall be embedded at time of casting.

2.2 DRYWELL

A. Drywell shall be precast concrete similar to "Precast Drywell", manufactured by E. F. Shea New England Concrete Products, Inc.

B. Hole in sections to receive piping may be cast into concrete or drilled.

C. Diameter of hole shall be 2 to 4 in. larger than outside diameter of entering pipe.

D. Drywell shall conform to AASHTO HS-20 loading, as specified in the AASHTO Specifications.

E. EMBEDMENT MATERIALS

F. Crushed stone fill shall consist of clean, washed stone.

2.3 AREA DRAINS

A. Area drains shall be NYLOPLAST or approved equal drain basin with 18″ internal diameter. The outlet to the structure shall accommodate a 6″ PVC pipe.

B. The cover shall be 18″ H-10 Pedestrian ADA compliant as approved by the Architect

2.4 EMBEDMENT MATERIALS

A. Crushed stone fill shall consist of clean, washed stone conforming to that specified in Section 310000, EARTHWORK.

2.5 BRICK

A. Brick for support of casting shall be any of the following types:
   1. Common brick meeting the physical requirements of ASTM C 62, Grade SW.
   2. Clay brick meeting the physical requirements of ASTM C 32, Grade MS.

2.6 PORTLAND CEMENT MORTAR

A. Mortar shall be a Portland cement mortar conforming to ASTM C 270, Type M.

B. Mortar shall contain a waterproofing admixture. Waterproofing admixture shall be one of the following:

Admixture	Manufacturer
Hydratite Plus	W.R. Grace and Company
Medusa Waterproofing	Medusa Portland Cement Company
Omicron Mortarproofing	Master Builders Company
Mortaron	The Aquabar Company
Hydrocide Powder	Sonneborn Building Products

2.7 NONSHRINK GROUT

A. Grout shall be non-shrink type similar to:

Product	Manufacturer
Embeco	Master Builders, Cleveland, OH
5 Star Grout	U.S. Grout Corp., Old Greenwich, CT
Upcon 262	Upco Co., Cleveland, OH
or approved equal.	

2.8 CASTINGS

A. All frames and covers shall be cast iron, heavy duty, conforming to ASTM A 48, Class 35 and shall be designed to safely withstand an AASHTO HS-20 loading.

B. All frames and grates shall be Town of Bedford standard and of uniform quality, free from blow holes, shrinkage, distortion or other defects. They shall be smooth and well cleaned by shotblasting and fitted together in a satisfactory manner. Round frames and covers shall have a continuously machined bearing surface to prevent rocking and rattling.

C. All frames and covers shall conform to the MassDOT Specifications M 8.03.0.

D. Castings shall have a shop-applied coal-tar-pitch varnish coating, thoroughly covering all metal.

E. Manhole frame and cover shall have a circular clear opening of 24 inches and a total frame and cover weight of at least 475 lbs. with the word "DRAIN" centered on the cover (Town of Bedford standard)

F. Upon completion of all hardscape and paving work all covers shall be cleared of foreign material (i.e. bituminous material, concrete, mortar etc). After cleaning the covers shall be removed and build-up of material inside the frame cleared to ease future removal of covers.

2.9 BITUMINOUS PAINT

A. Bituminous paint shall be a bituminous base product as approved by the Architect.

2.10 ASPHALT MASTIC CEMENT

A. Asphalt mastic cement shall be an asbestos-fibered, pitch-base or asphalt-base compound conforming to Fed. Spec. SS-C-153.

2.11 OIL INTERCEPTOR HOOD

A. All proposed catch basins shall be constructed with oil hoods. Oil hoods shall be Town of Bedford Standard.

2.12 ACCESS RISER

A. Access Riser shall be precast concrete construction.

B. Precast concrete access risers shall conform to ASTM C 478, and shall be similar to those manufactured by:

Concrete Systems, Inc., Hudson, NH.
Chase Precast Corp., North Brookfield, MA
Superior Concrete Co., Inc., Auburn, ME
or approved equal.

1. Sections shall have tongue and groove joints.
2. Joints between sections shall be made with preformed rubber gaskets conforming to ASTM C 443. 3. Each section shall have no more than two suitable lifting holes or cast-in lifting devices.

2.13 PVC PIPE AND FITTINGS (NON PRESSURE)

A. Polyvinyl chloride (PVC) non-pressure pipe for gravity drainage shall conform to ASTM D 3034, SDR 35 minimum wall thickness or ASTM D 1785 Schedule 40 when specified on the Drawings.

B. Pipe shall be bell-and-spigot type, furnished in standard lengths of 12'-6".

C. Bell end shall be an integral wall section with solid cross section rubber ring, factory assembled.

D. Spigot end shall be beveled to ensure proper insertion. Spigot end shall be imprinted with an "assembly stripe", to which the bell end of the mated pipe will extend upon proper jointing of the two pipes.

E. Rubber rings shall conform to ASTM D 3212.

F. Pipe ends shall permit checking of the rings with a feeler gauge to ensure their proper location in the coupling grooves.

G. PVC fittings shall be bell-and-spigot type compatible with the pipe.

2.14 PVC PIPE EMBEDMENT MATERIALS

A. PVC pipe shall use Class III embedment materials as defined in ASTM D 2321.

2.15 WASHED STONE

A. Stone used as part of the infiltration system shall be ¾" – 1½" washed stone. The stone shall be free from shale, clay, organic materials and debris. Not more than 0.5% of satisfactory material passing a No. 200 Sieve will be allowed to adhere to the stone.

2.16 FILTER FABRIC

A. Filter Fabric shall consist of Mirafi 140 N or

Trevira Spunbound Fabric Type 1120	Hoechst Fibers Industries Spartansburg, SC 29304
Supac N 5NP(UV)	Phillips Fibers Corporation Greenville, SC 29602

or approved equivalent.

PART 3 - EXECUTION

3.1 MANHOLES, CATCH BASINS, AND DRYWELL INSTALLATION

A. Manholes, catch basins and drywells shall be set to the required elevation and shall be plumb and vertical, with each section in true alignment.

1. Lifting holes in precast sections shall be thoroughly plugged with mortar and finished smooth and flush with adjoining surfaces.
2. Drain pipe shall extend, around its entire circumference, to inside surface of wall of structure into which it is inserted. Pipe shall be joined to manhole wall using either a flexible manhole sleeve or nonshrink grout. For grouted joints, surface between pipe and wall shall be filled with nonshrink grout.

B. Brick shall be employed to bring cast iron frame, cover, and grate to required elevation. Completed brick installation shall be coated with at least a 3/4 in. thickness of mortar on outside to provide a fully sealed and watertight collar between the top of the manhole section and the cover or grate frame.
1. Before installation of castings, chipped and scraped areas shall be touched up with one coat of bituminous paint.
2. Cast iron frame shall be set concentric with manhole opening in a full bed of mortar. A thick ring of mortar extending to the outer edge of brick or concrete shall be placed all around the bottom flange of the cast iron frame. Mortar surface shall be smooth and shall be sloped to shed water away from the frame.
3. Waterproofing shall be added to the mortar for underground masonry in accordance with the water proofing manufacturers directions. Other additives will not be permitted in the mortar.

C. Portland cement-based mixtures used on this work shall receive a minimum of three days of moist curing, which shall start immediately after the material has been placed. Suitable means shall be employed to protect cement-based mixtures from too rapid drying and damage from cold weather and frost.

D. Manholes shall have concrete bench formed to provide a smooth channel between all inlet and outlet pipes. Top of benching shall be level with the crown of the pipes.

3.2 OIL INTERCEPTOR HOOD

A. Oil interceptor hood shall be installed in accordance with the manufacturer's recommendation.

3.3 PVC PIPE INSTALLATION

A. Piping shall be installed essentially as indicated on the Drawings.

B. PVC pipe installation shall conform to ASTM D 2321.
1. Bottom of trench excavation shall be kept dry and free of water during pipe installation. Adequate measures shall be taken to prevent flotation of pipe in the trench.
2. Pipe shall be thoroughly cleaned before installation, and shall be maintained free from foreign matter during installation.
3. Each pipe length shall be installed to form a close joint with the next adjoining length and bring inverts to the required grade.
4. Piping shall be properly graded, free from pockets.

5. No pipe or fitting shall be permanently supported on saddles, blocking, or stones.
6. Where necessary, tight-fitting temporary wood bulkheads shall be employed to close ends of pipeline at end of each day's work.
7. Entire length of pipe shall be thoroughly flushed clean following completion of backfill.

3.4 CLEANING AND INSPECTION - GRAVITY SYSTEM

A. As directed by the Owner's Representative, the Contractor shall clean and inspect the existing storm drainage system.

B. Contractor shall be aware of flow conditions, and be able to identify potential access problems to storm access points.

C. Line Cleaning: Clean designated storm lines using approved methods and equipment.
   1. Remove internal obstructions such as roots or gaskets by trenchless techniques when obstruction encountered prevents further pipe cleaning.
      a. Provide special attention during cleaning operation to assure almost complete removal of roots from joints.
      b. Procedures to remove internal obstructions may include use of equipment such as rodding machines, root saws, bucket machines and winches using root cutters, porcupines, and jet machines equipped with hydraulically driven cutters.
   2. If cleaning of entire section cannot be successfully performed from one manhole, set up equipment at other manhole and attempt cleaning again.
      a. If successful cleaning cannot be performed or equipment fails to traverse entire storm line section, it will be assumed that major blockage exists.
      b. Temporarily suspend cleaning effort and immediately notify Architect.
      c. Upon removal of obstruction, complete cleaning operation.
   3. Employ satisfactory precautions to protect storm line from damage that might be inflicted by improper use of cleaning equipment.
      a. Immediately notify Architect if fresh soil, pieces of pipe, or other visible signs of potential problems occur during cleaning operation.
      b. Insure that water pressure created does not cause damage due to flooding of property being served by storm section(s) involved.

D. Removal of Debris: Flush debris downstream and do not remove.

E. Do not discharge sewage or solids removed from downstream manholes, onto streets, or into ditches, catch basins or storm drains.

F. All new drainage piping and drainage structures will be inspected and cleaned using an approved method at the completion of construction.

G. A video inspection of the entire drainage system, up to and including the connection to the municipal system, is required upon cleaning. Three copies of the

final inspection will be submitted to the Architect for their records. The inspection shall be recorded on DVD media. VHS tapes of the inspection will not be accepted.

END OF SECTION

TBA ARCHITECTS, INC.