



Project Manual

Bid No. 18-35

Arlington Public Schools

OTTOSON MIDDLE SCHOOL

Roof-Top Unit Replacement

Arlington, Massachusetts

AWARDING AUTHORITY

TOWN OF ARLINGTON

acting through and by its

TOWN MANAGER

Town Hall Annex

730 Massachusetts Ave.

Arlington, MA 02476

ARCHITECT

DRUMMEY ROSANE ANDERSON, INC.

235 Bear Hill Rd., 4th Floor

Waltham, MA 02451

June 27, 2018

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

TABLE OF CONTENTS

Table of Contents

PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

Division 00 – Procurement and Contracting Requirements

Invitation for Bid
Instructions to Bidders
Bid Form
Town of Arlington General Contract
Payment Bond
Performance Bond
Consolidated General Conditions of Contract for Construction
Supplemental Statutory Conditions
The Massachusetts Prevailing Wage Law
 - Weekly Payroll Records and Statement of Compliance
 - MA Weekly Certified Payroll Report Form
 - Prevailing Wage Rates
CORI Acknowledgement Form
SORI Form

SPECIFICATION GROUP

GENERAL REQUIREMENTS SUBGROUP

Division 01 - General Requirements

Section 01 11 00	Summary of Work
Section 01 31 13	Project Coordination
Section 01 33 00	Submittal Procedures
Section 01 41 00	Regulatory Requirements
Section 01 50 00	Temporary Construction Facilities and Controls
Section 01 52 19	Temporary Sanitary Facilities
Section 01 60 00	Product Requirements
Section 01 73 00	Execution Requirements
Section 01 73 29	Cutting and Patching
Section 01 77 00	Contract Closeout

Divisions 23 – Heating Ventilating and Air Conditioning

Section 23 00 00	Heating, Ventilating, and Air Conditioning
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LIST OF DRAWING SHEETS

ME-1	Mechanical Details, Legend & General Notes
ME-2	Mechanical Demolition & Renovation Plans

END - TABLE OF CONTENTS

OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA

INVITATION FOR BID

Sealed Bids for construction of:

Ottoson Middle School
Roof-Top Unit Replacement
Arlington, MA.

in accordance with Contract Documents prepared by:

DRUMMEY ROSANE ANDERSON, INC.
235 Bear Hill Road, 4th Floor
Waltham, MA 02451

hereinafter called the Architect, will be received by:

Town of Arlington
acting by and through its
Town Manager: Mr. Adam Chapdelaine

hereinafter called the "Awarding Authority", or "Owner" at:

Purchasing Department
Town Hall Annex
730 Massachusetts Ave.
Arlington, MA 02476
Attention: Town Manager Mr. Adam Chapdelaine

Bidding procedures and award of the Contract shall be in accordance with the provisions of General Laws of the Commonwealth of Massachusetts Chapter 30, Section 39M; Chapter 149, Sections 44A through 44L; Chapter 193 of the Acts and Resolves of 2004, An Act Further Regulating Public Construction in the Commonwealth; and Chapter 507 of the Acts and Resolves of 2004, an Act Further Regulating Public Construction; including all current amendments.

For this project, the HVAC Bidder shall act as the Prime Contractor. All Bidders must be certified by DCAM for the category of work and dollar amount of this Project. The Prime Contractor shall be DCAM certified in the category "Heating, Ventilating and Air Conditioning". Each Bidder must submit a copy of the **Certificate of Eligibility** from DCAM showing that it is eligible to bid on the Project. Each Bidder must also submit an **Update Statement** with its bid.

Bids shall be received by the Awarding Authority at the address listed above, no later than

11:00 AM, local legal time, July 19, 2018.

at which times and place they will be publicly opened and forthwith read aloud. Any bid received after the time and date specified will not be considered.

A bid deposit in the amount of five percent (5%) of the Bid amount shall be submitted with each Bid. Bid deposit shall be in the form of certified check, Treasurer or Cashier's check issued by a responsible bank or trust company payable to **Town of Arlington**, or a bid bond (a) in a form satisfactory to the Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon faithful performance by the principal of the agreements contained in the Bid. Return of bid deposits will be in accordance with the provisions of the applicable Massachusetts General Laws.

The Awarding Authority will reject Bids when required to do so by the above-referenced General Laws. In addition, the Awarding Authority reserves the right to waive any informalities in bidding and to reject any and all Bids if it deems to be in the public interest to do so. Also, the Awarding Authority reserves the right to reject any bid if it determines that such bid does not represent the bid of a person or firm competent to

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

perform the work as specified, or if less than three bids are received, or if bid prices are not acceptable without further competition.

The successful Bidder will be required to furnish a **Payment Bond and Performance Bond** in the amount of **100%** of the applicable maximum Contract Amount. The cost of such bonds shall be included in the bid price. Such bonds shall be of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and in a form satisfactory to the Awarding Authority.

Wages and contributions to be paid employees on the Project shall not be less than those established by a schedule issued by the Commissioner of the Department of Labor and Workforce Development of the Commonwealth of Massachusetts, in accordance with MGL c.149, §§ 26 to 27H inclusive, a copy of which is included in the Contract Documents, and shall be made a part of the Contract.

Contract Documents including Specifications will be available for pick up on **06/27/18 at 12:00PM** at:

**Andrew T. Johnson Co
15 Tremont Place
Boston, MA 02108
617-742-1610**

There is no plan deposit per set (maximum 2 sets). Bidders requesting documents to be mailed, shall include a separate check, (company, certified, or money order) made out to Andrew T. Johnson Co in the amount of \$15.00 for UPS Ground service.

Bidding documents will also be made available online at **atjplanroom.com**. Go to www.atjplanroom.com, click on Public Jobs then the project name. Drawings and Specifications will be available to view and download. **To download you must register for a free account, which will place you on the plan holders list to receive addendums when issued.**

Contract Documents may also be examined during regular office hours at the Architect's office free of charge.

The Awarding Authority is exempt from sales and federal excise tax to the extent permitted under law; bidders should not include such taxes in figuring or in references to any bid.

There is no scheduled pre-bid conference. To schedule a visit to the site, bidders are required to contact Mark Miano at 781-389-7891.

Commonwealth of Massachusetts General Laws are incorporated herein by reference. Any inconsistency between the Invitation to Bid, Instructions to Bidders, Bid Forms, Conditions of the Contract, and any other Contract Documents and these statutes, or any other applicable statutes, bylaws, or regulations existing on the date on which the bids are to be received, shall not be grounds for invalidating the bidding procedures, but, where required by law, such statute, bylaw, or regulation shall be deemed to govern.

**TOWN OF ARLINGTON
acting through and by its
TOWN MANAGER**

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

INSTRUCTIONS TO BIDDERS

1.00 COMPLEMENTARY DOCUMENT

- A. INVITATION FOR BID, included herewith, is complementary to this document and shall be carefully reviewed by bidders for specific instructions which are not repeated herein.

2.00 STATUTES REGULATING COMPETITIVE BIDDING

- A. Bidding procedures and award of contract shall be in accordance with the provisions of Chapter 30, Section 39M and Chapter 149, Sections 44A through 44L of the General Laws of the Commonwealth of Massachusetts, including all current amendments.
- B. In the event of any discrepancy or inconsistency between the provisions of these Instructions to Bidders and Contract Documents and the above-mentioned statutes, the provisions of the above-mentioned statutes shall govern. In such event, the application of all remaining provisions not in conflict to any circumstance other than that in which the conflict occurs shall not be affected thereby.

3.00 BIDDER'S QUALIFICATIONS

- A. No individual or firm may submit a Bid unless it includes, in the Bid Form, a list of at least **Three (3)** references of similar projects completed in the last **Five (5)** years.
- B. The Awarding Authority will reject Bids when required to do so by the above-referenced General Laws. In addition, the Awarding Authority reserves the right to waive any informalities in bidding and to reject any and all Bids if it deems to be in the public interest to do so. Also, the Awarding Authority reserves the right to reject any bid if it determines that such bid does not represent the bid of a person or firm competent to perform the work as specified, or if less than three bids are received, or if bid prices are not acceptable without further competition.

4.00 INTERPRETATION OF DOCUMENTS: NOTIFICATION OF ERRORS

- A. Interpretation of the provisions of the Contract Documents will be made by the Architect upon written request of any bidder, provided that such request is received by the Architect at least seven (7) days prior to date of applicable bid opening, and that the Architect considers such interpretation to be of sufficient importance. Oral or telephone interpretations will not generally be made, and if made, shall be strictly informal and not legally valid or binding.
- B. Architect's interpretations shall be in the form of Addenda to the Contract Documents.
- C. Bidders are urged to communicate all errors or discrepancies found in the Contract Documents to the Architect. Telephone calls pointing out any such errors or discrepancies will be taken by the Architect, but only for the purpose of receiving the information in order that it may be properly processed, and not for interpretation or clarification.

5.00 EXAMINATION OF CONTRACT DOCUMENTS AND SITE

- A. Each Bidder shall carefully examine the Contract Documents to obtain a thorough understanding of the work of his bid in addition to work of related trades. In addition, each Bidder shall personally visit the site to become thoroughly acquainted with the conditions as they exist thereon.
- B. Failure of any Bidder to thoroughly examine the Contract Documents, or to visit and examine the site shall in no way relieve the bidder of any obligation with respect to his/her bid or of any responsibility assigned the bidder under the Contract.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

6.00 PRE-BID SITE VISIT

- A. Pre-bid site visit will be held at location and time stipulated in the INVITATION FOR BID.

7.00 MODIFICATION AND WITHDRAWAL OF BIDS

- A. Modifications of Bids will be permitted after submission of such bids provided clearly written, readily understandable instructions for same are received by the Awarding Authority in writing prior to time established for opening of such bids.
- B. No Bid may be withdrawn for a period of **30** days, excluding Saturdays, Sundays and legal holidays, after actual date of the Bid opening.

8.00 ADDENDA

- A. Architect's interpretations shall be in the form of Addenda to the Contract Documents. [Addenda will be posted electronically to Andrew T. Johnson's website www.atjplanroom.com \(referenced in the invitation to bid\) and notification sent out via email to all plan holders.](http://www.atjplanroom.com) Failure to receive such Addenda shall in no way relieve any bidder from the execution of its provisions. All bidders are cautioned to verify the number of Addenda that have been issued and to secure any needed copies from the Architect before submitting a bid.
- B. Bidders shall acknowledge each and every Addendum in the spaces provided on the Bid Form. Failure of a bidder to acknowledge each and every Addendum in the space provided on the Bid Form may cause rejection of the bid.

9.00 BID FORM

- A. The Awarding Authority will make available to every person applying therefore, a Form for General Bid. Each bona fide General Bidder will be furnished forms for his/her proposal upon request. Such forms will be made available at the Architect's office during the regular office hours throughout the bidding period. Bids must be submitted on the forms provided by Architect or on forms included in the bid documents of the Project Manual.
- B. All blank spaces provided on the bid forms shall be filled in with ink or typewritten. Where space is provided, sums shall be expressed in both words and figures. In case of discrepancy between the two, the written words shall govern.
- C. No interlineations, additions, alterations, or erasures shall be made on the forms.
- D. The Awarding Authority is exempt from sales and federal excise tax to the extent permitted under law; bidders should not include such taxes in figuring or in references to any bid.

10.00 ALTERNATES

[Not Applicable.]

11.00 SUBMISSION OF BIDS

- A. The **Bid Form** shall be properly executed and enclosed with **Bid Deposit** (equal to 5% of the value of the total bid) in a sealed envelope. Sealed envelope shall be plainly marked on the outside with the following information:

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

BID FOR: **Roof-Top Unit Replacement
Ottoson Middle School
Arlington, MA.**

SUBMITTED BY: _____
(Name of Bidder)

(Address of Bidder)

- B. If Bid is mailed, the above-required envelope shall be enclosed in a second envelope identified with the above markings and mailed to the place of bid opening, as stipulated in the Invitation for Bid. Mailed Bids must be received before time scheduled for opening of bids.
- C. A bid deposit in the amount of five percent (5%) of the Bid amount shall be submitted with each Bid. Bid deposit shall be in the form of certified check, Treasurer or Cashier's check issued by a responsible bank or trust company payable to **Town of Arlington**, or a bid bond (a) in a form satisfactory to the Awarding Authority, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts, and (c) conditioned upon faithful performance by the principal of the agreements contained in the Bid. Return of bid deposits will be in accordance with the provisions of the applicable Massachusetts General Laws.

12.00 PAYMENT AND PERFORMANCE BONDS

- A. The **Payment and Performance Bonds** required of the Contractor shall be in the amount of **100%** of the Contract Sum from a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and in a form satisfactory to the Awarding Authority.

13.00 FOREIGN CORPORATIONS

- A. The attention of bidders is called to the General Laws, Chapter 30, Section 39L, as amended by The Acts of 1967, Chapter 3, under which the Awarding Authority may not enter into a contract with a foreign corporation (a corporation not organized under the Laws of Massachusetts), nor approve a foreign corporation as a contractor, unless the foreign corporation has filed with the Awarding Authority a certificate by the State Secretary stating that the foreign corporation has complied with General Laws, Chapter 181, Sections 3 and 5, and stating the date of such compliance.

14.00 AWARD OF CONTRACT

- A. The Contract will be awarded to the lowest responsible, competent and eligible bidder in accordance with Chapter 149, Sections 44A through 44J of the Massachusetts General Laws.
- B. The Awarding Authority reserves the right to reject general bids in accordance with the provisions of Massachusetts General Laws, Chapter 149, §§44A-44J.

In addition, the Awarding Authority may consider informal and may reject any bid which is not prepared and submitted in accordance with all requirements of the bid documents, or which contains erasures, alterations, additions, errors or irregularities of any kind, or which contains proposed prices for any class or item of work which are, in the judgment of the Awarding Authority, substantially less or more than the actual cost to complete the work; provided, however, that the Awarding Authority reserves the right to waive any and all informalities as to form. Matters as to substance shall not be waived. Subject to the provisions of applicable laws, if the bid forms, specifications, or any other bid documents require submission of special information or data to accompany bids for any trade, if applicable, and any bidder neglects to furnish such information or data with its bid, the

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

Awarding Authority may reject the bid of such bidder as incomplete; provided, however, that the Awarding Authority reserves the right to deem any such omission as an informality for which such bid will not be rejected, and to subsequently receive such information or data prior to award of the contract. See Section 3.00 above as to the Awarding Authority's right to reject the bid of any bidder who is not qualified, competent and responsible.

15.00 COMMENCEMENT AND COMPLETION OF WORK

- A. The successful bidder, upon execution of the Contract Agreement, which may constitute as Notice to Proceed unless specifically indicated by Awarding Authority otherwise, shall commence the work of the Contract within seven (7) calendar days. Thereafter the Contractor shall diligently and continuously carry on the work in such manner as to substantially complete the work of on or before [the date as stipulated in Division 01 Section "Town of Arlington General Contract"](#).

16.00 LIQUIDATED DAMAGES

- A. Liquidated damages for not completing the work within the time limit specified above will be assessed by the Owner. Liquidated damages will be in the amount as stipulated in ["Town of Arlington General Contract"](#). The liquidated damages amount per calendar day is a minimum damage figure to compensate the Owner for administrative costs and loss or delay of its use of the project, and for added Owner's Project Manager, Architect and consultant fees, and does not limit in any way the liability of the Contractor for damages in excess of the specified liquidated damages amount for other damages, in particular, damages for breach of Contract. It is expressly understood that such liquidated damages do not constitute a penalty.

END OF DOCUMENT

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

BID FORM

TO THE AWARDING AUTHORITY:

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

Ottoson Middle School
ROOF-TOP UNIT REPLACEMENT
Arlington, MA

in accordance with accompanying Plans and Specifications prepared by the Architect

Drummey Rosane Anderson, Inc.
235 Bear Hill Road, 4th Floor
Waltham, MA 02451

for the Contract Price specified below, subject to additions and deductions according to the terms of the Specifications.

B. This Bid includes Addenda numbered: _____.

C. The proposed Contract Price is:

_____ Dollars.

(\$ _____).

D. 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 Contract Documents:

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

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

3. List **three** (3) separate Owner references for projects completed in the past **five** (5) years on which you served as contractor for work of similar character as required for this project:

<u>Project</u>	<u>Owner Ref. Name</u>	<u>Telephone No.</u>	<u>Amount of Contract</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

4. Bank Reference: _____.

E. **The undersigned hereby certifies, under the pains and penalties of perjury, that he has carefully examined the Contract Documents, established a thorough understanding of the existing conditions, and has obtained sufficient information for executing the work of his bid and the work of all related trades.**

F. The undersigned agrees that, if selected as Contractor, he will within five (5) days, Saturdays, Sundays, and legal holidays excluded, after presentation thereof by the Awarding Authority,

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

execute the Contract in accordance with the terms of this bid and furnish a labor and materials payment bond and performance bond, of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority, and in the amount no less than **100%** of the Contract Price, the premiums for which is to be paid by the Contractor and is included in the Contract Price.

- G. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with Owner's separate contractor(s) and all other elements of labor employed or to be employed on the work and that he/she will comply fully with all laws and regulations applicable to awards made subject to MGL c.149, § 44A.
- H. The undersigned bidder hereby certifies, under the pains and penalties of perjury, 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 Workforce Development. The undersigned bidder agrees to indemnify the awarding authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work, arising out of or as a result if (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wages rates or (2) the failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.
- I. The undersigned hereby certifies that all employees to be employed at the worksite shall have successfully completed a course in construction safety and health approved by the **OSHA** that at least **10 hours** in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.
- J. **The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person.** As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.
- K. The undersigned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any chapter of the General Laws or any rule or regulation promulgated thereunder.

Date: _____ (Name of General Bidder)

Signed: _____

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

(Business Address)

(City and State)

(Business Telephone Number)

TOWN OF ARLINGTON
GENERAL CONTRACT

THE TOWN OF ARLINGTON, a municipal corporation of the Commonwealth of Massachusetts, acting through its Town Manager, and

(The Contractor)

hereby mutually agree as follows:

ARTICLE I - THE CONTRACT DOCUMENTS

The Contract Documents, as defined in the CONSOLIDATED GENERAL CONDITIONS, including said CONSOLIDATED GENERAL CONDITIONS are hereby incorporated by reference and made a part hereof, and shall include Addenda and Alternates, if any.

ARTICLE II - GENERAL DESCRIPTION OF THE WORK

The Contractor shall furnish all of the materials and perform all of the Work required by the Contract Documents entitled **Ottoson Middle School Roof-Top Unit Replacement** dated **June 27, 2018** prepared by **Drummeey Rosane Anderson, Inc., Bear Hill Road, 4th Floor, Waltham, MA 02451**, acting as, and in these Contract Documents entitled, the Architect.

ARTICLE III – COMMENCEMENT AND COMPLETION OF WORK AND LIQUIDATED DAMAGES

It is agreed that time is of the essence of this Contract.

The Contractor shall commence work only upon the execution of this Contract by the Town of Arlington by its Town Manager, the certification of the availability of the appropriation by the Town Comptroller, approval as to form by the Town Counsel, and upon Issuance of a Notice to Proceed, and shall bring the Work to Substantial Completion by **December 1, 2018**, and to Final Completion within 45 calendar days thereafter. Liquidated damages in the amount of \$500 per calendar day will be applicable after the date of Substantial Completion for which the project is not substantially complete, and for each day after the date of Final Completion for which the project is not finally complete, and otherwise in accordance with the provisions of the CONSOLIDATED GENERAL CONDITIONS. The liquidated damages amount per calendar day is a minimum damage figure to compensate the Owner for administrative costs and loss or delay of its use of the building and site, and does not limit in any way the liability of the Contractor for damages in excess of the specified liquidated damages amount for other damages, for example, damages for breach of Contract, and added architect and consultant fees. It is expressly understood that such liquidated damages do not constitute a penalty. All work shall be phased (if applicable) in accordance with the Contract Documents.

NOTE: NOTWITHSTANDING ANYTHING TO THE CONTRARY, THE TIME OF COMMENCEMENT SHALL ONLY BE BY WRITTEN NOTICE TO PROCEED WITH THE

WORK AS DATED AND ISSUED TO THE CONTRACTOR BY THE TOWN OF ARLINGTON. NOTICE TO PROCEED MAY BE GIVEN ANYTIME AFTER THE AWARD OF THE CONTRACT, BUT NOT LATER THAN 14 DAYS AFTER THE EXECUTION OF THE CONTRACT.

ARTICLE IV – COMPENSATION TO BE PAID BY TOWN

The Town shall pay and the Contractor shall accept, as full compensation for everything furnished, done by or resulting to the Contractor in carrying out this Contract, subject to additions and deductions in the Contract Documents in the sum of:

_____ (\$ _____)

ARTICLE V – AVAILABILITY OF APPROPRIATION

This Contract is subject to an appropriation being available therefor.

This Contract is executed by the Town of Arlington and by the Contractor as of this _____ day of _____, 2018.

TOWN OF ARLINGTON

Signed: _____
Town Manager

Approved as to Availability
Of Appropriation

Town Comptroller

CONTRACTOR:

Signed: _____

By: _____
(Name)

(Title)

Approved as to Form:

Town Counsel

(Address)

(Affix Corporate Seal Here)

Bond No. _____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENT, that we _____ with a place of business at _____ as principal (the "Principal"), and _____, a corporation qualified to do business in the Commonwealth of Massachusetts, with a place of business at _____ as Surety (the "Surety"), are held and firmly bound unto **TOWN OF ARLINGTON** as Obligee (the "Obligee"), in the sum of _____ lawful money of the United States of America, to be paid to the Obligee, for which payment, well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these present.

WHEREAS, the Principal has assumed and made a contract with the Obligee, bearing the date of _____, for the construction of _____.

NOW, THE CONDITIONS of this obligation are such that if the Principal and all subcontractors under said contract shall pay for all labor performed or furnished and for all materials used or employed in said contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said contract that may hereafter be made, notice to the Surety of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, the provisions of Massachusetts General Laws, Chapter 30, Section 39A, and Chapter 149, Section 29, as amended then this obligation shall become null and void; otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREFORE, the Principal and Surety have hereto set their hands and seals this _____ day of _____, 2018.

PRINCIPAL

SURETY

[Name and Seal]

[Attorney-In-Fact] [Seal]

[Title]

[Address]

[Phone]

Attest: _____

Attest: _____

The rate for this bond is _____% of the first \$ _____ and _____% for the next \$ _____.

The total premium for this Bond is \$ _____.

END OF PAYMENT BOND

Bond No. _____

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS:

That we _____(Name of Contractor), a
_____ hereinafter called "Principal" and
(Corporation, Partnership, Joint Venture or Individual) _____,
hereinafter called the "Surety" and licensed by the State Division of Insurance to do business
under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Owner,
in the penal sum of _____ Dollars
(\$ _____) in lawful money of the United States, for the payment of which
sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and
successors, jointly and severally, firmly by these presents.

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

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

In the event that the contract is abandoned by the Contractor or is terminated by the
Owner, said surety hereby further agrees that said surety shall, if requested in writing by the
Owner, take such action as is necessary to complete said contract.

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

ATTEST:

(Principal Secretary)

By

Principal

(Address-Zip Code)

Witness as to Principal (SEAL)

(Address-Zip Code)

ATTEST:

Surety

_____ By

(Attorney-in-Fact)

(Address-Zip Code)

Witness as to Surety (SEAL)

(Address-Zip Code)

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

END OF PERFORMANCE BOND

CONSOLIDATED GENERAL CONDITIONS
OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1

GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

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

In the event of any conflict among the Contract Documents, the Documents shall be construed according to the following priorities:

Highest Priority:	Modifications
Second Priority:	Agreement
Third Priority:	Addenda--later date to take precedence
Fourth Priority:	Supplemental Statutory Conditions
Fifth Priority:	Consolidated General Conditions
Sixth Priority:	Specifications and Drawings
Seventh Priority:	Instructions to Bidders and Proposal

Any references throughout the contract documents (or any other project documents) to "General Conditions" or "Supplementary General Conditions" are deleted and "Consolidated General Conditions and Supplemental Statutory Conditions" is substituted therefor. All bidders and sub-bidders take note that the Town has consolidated and modified former versions of the standard form AIA Document A210 General Conditions of the Contract for Construction with the Town's desired Supplementary General Conditions into one document. The Supplemental Statutory Conditions remain intact and separate, and form a part of the Contract Documents.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. Except as provided in Paragraph 3.18, nothing contained in the Contract Documents shall be construed to create any contractual relationship (1) between the Architect and the Contractor, (2) between the Owner or the Architect and a Subcontractor or Sub-subcontractor, (3) between the Owner and the Architect, or (4) between any persons or entities other than the Owner and the Contractor. The Contract Documents shall comply with the requirements of Mass. Gen. Laws Chapter 44, Section 31C.

1.1.3 THE WORK

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

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

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

1.1.6 THE SPECIFICATIONS

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

1.1.7 THE PROJECT MANUAL

The Project Manual is the volume usually assembled for the work which may include the bidding requirements, sample forms, Consolidated General Conditions of the Contract and Specifications.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed by the Owner and Contractor as provided in the Agreement. A copy of the signed set shall be deposited with the Architect. If either the Owner or Contractor or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents. By executing the Contract, the Contractor also certifies, under penalties of perjury, that to the best of his information, knowledge and belief he has complied with all laws of the Commonwealth of Massachusetts relating to taxes.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others.

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

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

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

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

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

1.2.9 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work.

Such Work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence.

1.2.10 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in Subparagraph 3.2.5 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.

1.2.11 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architect in the design of the Project or Work. The Owner does not hold out such information to the Contractor as an accurate or approximate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in Subparagraph 4.3.6.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS

1.3.1 The Drawings, Specifications and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any Subcontractor, Sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated, and except as provided in the Owner/Architect Agreement for the Project, the Architect shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect, on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any Subcontractor, Sub-subcontractor or material or equipment supplier on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's copyright or other reserved rights.

Notwithstanding anything herein to the contrary, as between the Owner and Architect, their rights and obligations with respect to the Architect's instruments of service are governed by the provisions of the Owner/Architect Agreement for the Project.

1.4 CAPITALIZATION

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

1.5 INTERPRETATION

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

ARTICLE 2

OWNER

2.1 DEFINITIONS

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. From time to time herein the Owner is referred to as the Town.

2.1.2 The Project Manager is the person or entity identified as such in writing by the Owner, at the Owner's option. The Project Manager shall act as the Owner's representative with respect to all matters pertaining to the Project. The duties, responsibilities, and obligations of the Project Manager under this Contract may be modified from time to time by the Town, so long as such modifications do not interfere materially with the Contractor's performance of the Work hereunder, and so long as the Contractor is given notice of any such modifications that affect the Contractor's performance of the Work.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner upon reasonable written request shall furnish to the Contractor in writing information which is necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein at the time of execution of the Agreement.

2.2.2 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

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

2.2.4 Information or services required of the Owner hereunder shall be furnished by the Owner with reasonable promptness after receipt from the Contractor of a written request for such information or services.

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

2.2.6 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or persistently fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed by the Project Manager, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

2.3.2 The Owner 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 Owner; provided however, that if there is a suspension, delay or interruption ordered by the Owner for fifteen days or more or due to a failure of the Owner to act within the time specified in this Contract, the Owner 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 Contractor on such increase; and provided further, that the Owner 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.

2.3.3 The Contractor must submit the amount of a claim under Subparagraph 2.3.2 to the Owner 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 21 days after the end thereof. Except for costs due to a suspension order, the Owner shall not approve any costs in the claim incurred more than twenty days before the Contractor notified the Owner in writing of the act or failure to act involved in the claim.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

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

ARTICLE 3

CONTRACTOR

3.1 DEFINITION

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

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 Before starting the Work, and at frequent intervals during the progress thereof, the Contractor shall carefully study and compare the Contract Documents with each other and with any information furnished by the Owner pursuant to Subparagraph 2.2.2 and shall at once report to the Architect any error, inconsistency or omission the Contractor may discover. Any necessary change shall be ordered as provided in Article 7, subject to the requirements of Paragraph 1.2 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, or if by reasonable study of the Contract Documents the Contractor could have discovered such, the Contractor shall bear all costs arising therefrom.

3.2.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once. Any necessary change shall be ordered as provided in Article 7, subject to the requirements of Paragraph 1.2 and other provisions of the Contract Documents. If the Contractor proceeds with the Work without such notice to the Architect, having discovered such errors, inconsistencies or omissions, the Contractor shall bear all costs arising therefrom.

3.2.3 The Contractor shall perform the Work in accordance with the Contract Documents and any submittals made in accordance with Paragraph 3.12.

3.2.4 The Contractor shall give the Architect timely notice of any additional Drawings, Specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

3.2.5 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in Subparagraph 3.2.4. If the Contractor proceeds with such Work without obtaining further Drawings, Specifications or instructions, the Contractor shall correct Work incorrectly done at the Contractor's own expense.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract. Where the Contract Documents refer to particular construction means, methods, techniques, sequences or procedures or indicate or imply that such are to be used in the Work, such mention is intended only to indicate that the operations of the Contractor shall be such as to produce at least the quality of work implied by the operations described, but the actual determination of whether or not the described operations may be safely and suitably employed on the Work shall be the responsibility of the Contractor, who shall notify the Architect in writing of the actual means, methods, techniques, sequences or procedures which will be employed on the Work, if these differ from those mentioned in the Contract Documents. All loss, damage, liability, or cost of correcting defective work arising from the employment of any construction means, methods, techniques, sequences or procedures shall be borne by the Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents, unless the Contractor has given timely notice to the Owner and Architect in writing that such means, methods, techniques, sequences or procedures are not safe or suitable, and the Owner has then instructed the Contractor in writing to proceed at the Owner's risk.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons performing portions of the Work under a contract with the Contractor.

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

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

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. The word "provide" shall mean furnish and install completely, including connections, unless otherwise specified.

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

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect occurring after Substantial Completion and caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

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

3.5.3 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents, in accordance with the procedures set forth in Mass. Gen. Laws Chapter 30, Section 39I.

3.5.4 In requesting approval of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or

deviation meets or exceeds the requirements set forth in Mass. Gen. Laws Chapter 30, Section 39M(b). If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation.

3.5.5 The Contract Documents are intended to produce a building of consistent character and quality of design. All components of the building including visible items of mechanical and electrical equipment have been selected to have a coordinated design in relation to the overall appearance of the building. The Architect shall judge the design and appearance of proposed substitutes on the basis of their suitability in relation to the overall design of the Project, as well as for their intrinsic merits. The Architect will not approve as equal to materials specified proposed substitutes which, in the Architect's opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality of design of the Project. In order to permit coordinated design of color and finishes the Contractor shall, if required by the Architect, furnish the substituted material in any color, finish, texture, or pattern which would have been available from the manufacturer originally specified, at no additional cost to the Owner.

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

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

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

3.6 TAXES

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

3.7 PERMITS, FEES AND NOTICES

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

negotiations concluded. Notwithstanding the foregoing, the Town hereby waives the fee for the Town's building permit for the Project.

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

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

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

3.8 ALLOWANCES

3.8.1-3.8.2 OMITTED.

3.9 SUPERINTENDENCE

3.9.1 The Contractor shall employ a competent superintendent, acceptable to the Owner, and necessary assistants who shall be in attendance at the Project site full time during the progress of the Work until the date of Substantial Completion, and for such additional time thereafter as the Architect may determine to be necessary for the expeditious completion of the Work. The superintendent shall be licensed to act as superintendent in accordance with all applicable laws for projects of this type. The Contractor shall remove the superintendent if requested to do so in writing by the Owner, and shall promptly replace him with a competent person reasonably acceptable to the Owner. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

3.9.2 The Contractor shall retain a competent Registered Professional Engineer or Registered Land Surveyor, acceptable to the Architect, who shall establish the exterior lines and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated Work such as, but not limited to, roads, utilities and site grading. The Engineer or Land Surveyor shall certify as to the actual location of the constructed facilities in relation to property lines, building lines, easements, and other restrictive boundaries.

3.9.3 The Contractor shall establish the building grades, lines, levels, column, wall and partition lines required by the various Subcontractors in laying out their Work.

3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that

no trade, at any time, causes delay to the general progress of the Work. If such delays occur, the Owner may deduct anticipated liquidated damages from the Progress Payments to the Contractor. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor shall prepare and submit to the Architect a progress schedule, and shall comply with such schedule, as described in Subparagraphs 8.2.4 through 8.2.8.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of this Paragraph 3.12 and Paragraph 4.2.

3.12.5 The Contractor shall review, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness, in accordance with the Contractor's progress schedule approved by the Architect, and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

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

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

3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's review of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's review thereof.

3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. Unless such notice has been given, the Architect's review of a resubmitted Shop Drawing, Product Data, Sample, or similar submittal shall not constitute acceptance of any changes not requested on the prior submittal.

3.12.10 Informational submittals upon which the Architect is not expected to take responsible action may be so identified in the Contract Documents.

3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Owner shall be entitled to rely upon such certifications, and neither the Owner nor the Architect shall be expected to make any independent examination with respect thereto.

3.12.12 The Architect will not check dimensions or quantities on any Shop Drawings and will not assume any responsibility for any errors in dimensions or quantities on Shop Drawings.

3.13 USE OF SITE

3.13.1 The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times in the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Contractor shall confine the Contractor's apparatus, the storage of materials and the

operations of the Contractor's workers to limits indicated by law, ordinances, the Contract Documents and permits and/or directions of the Architect, and shall not unreasonably encumber the premises with the Contractor's materials. The Owner shall not be liable to the Contractor, the Subcontractors, their employees or anyone else with respect to the conditions of the premises, except only for a condition caused directly and solely by the negligence of the Owner.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor and its Subcontractors shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly, all to be performed in accordance with the requirements of the Contract Documents.

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

3.15 CLEANING UP

3.15.1 The Contractor daily shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials. Immediately prior to the Architect's inspection for Substantial Completion, the Contractor shall completely clean the premises. Concrete and ceramic surfaces shall be cleaned and washed. Resilient coverings shall be cleaned, waxed and buffed. Woodwork shall be dusted and cleaned. Sash, fixtures and equipment shall be thoroughly cleaned. Stains, spots, dust, marks and smears shall be removed from all surfaces. Hardware and all metal surfaces shall be cleaned and polished. Glass and plastic surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken or scratched glass or plastic shall be replaced by the Contractor at the Contractor's expense.

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

3.15.3 The provisions of paragraphs 3.15.1 and 3.15.2 shall apply equally to all subcontractors at the project insofar as each subcontractor's work is concerned.

3.16 ACCESS TO WORK

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

3.17 ROYALTIES AND PATENTS

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

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expense, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, caused in whole or in part by negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

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

3.18.3 The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the Architect, the Architect's consultants, and agents and employees of any of them arising out of (1) the preparation of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications, or (2) directions or instructions given by the Architect, the Architect's consultants, and agents or employees of any of them.

3.19 COVENANT NOT TO SUE

3.19.1 In consideration of the Contractor's undertaking to indemnify and hold harmless the Architect, the Architect's consultants and agents or employees of any of them, in accordance with Paragraph 3.18, agree that the Architect will not bring any civil suit, action or other proceeding in law, equity or arbitration against the Contractor, or the officers, employees, agents and servants of the Contractor, for or on account of any action which the Architect may have arising out of or in any manner connected with the Work, except to enforce the provisions of

Paragraph 3.18 and this Paragraph 3.19; and the Contractor, or any successor, assign or subrogee of the Contractor, agrees not to bring any civil suit, action or other proceeding in law, equity or arbitration against the Architect, or the officers, employees, agents and servants of the Architect, for the enforcement of any action which the Contractor may have arising out of or in any manner connected with the Work.

3.20 RECORD KEEPING REQUIREMENTS

3.20.1 The Contractor shall comply with all applicable requirements of Mass. Gen. Laws Chapter 30, Section 39R.

ARTICLE 4

ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

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

4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld. To the extent inconsistent herewith, the rights and responsibilities of the Architect shall be governed by the Owner/Architect Agreement for the Project.

4.1.3 In case of termination of employment of the Architect, the Owner shall appoint an architect whose status under the Contract Documents shall be that of the former architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with other provisions of the Contract.

4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. The Architect will visit the site at least once per week during periods of active construction. The Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an architect, the Architect will keep the Owner informed

of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

4.2.3 The Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or of any other persons performing portions of the Work.

4.2.4 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate through the Project Manager. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers generally shall be through the Contractor, although the Owner and Project Manager may have direct communications with subcontractors and suppliers intended to facilitate or expedite construction. Communications by and with separate contractors shall be through the Owner.

As to any written communications between two of the three of the Owner, Architect, and Contractor, a concurrent copy shall be sent to the third.

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

4.2.6 In accordance with generally accepted standards of professional practice the Architect will review, approve, and take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, for the purpose of checking for conformance with the Contract Documents. The Architect's action will be taken with reasonable promptness, while allowing sufficient time in the Architect's professional judgment to permit adequate review, and in any event shall take no longer than the time permitted by law. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of obligations set forth in Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods,

techniques, sequences or procedures. The Architect's action with respect to any specific item shall not indicate approval of an assembly of which the item is a component.

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

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

4.2.9 If the Owner and Architect agree in writing, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents. If no such exhibit has been so incorporated, the duties, responsibilities, and limitations of authority of such project representatives shall be as set forth in the edition of AIA Document B352 current as of the date of the Agreement.

4.2.10 The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. The Architect may, as the Architect judges desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work; such drawings or instructions may be effected by field order or other notice to the Contractor, and provided such drawings or instructions are reasonably consistent with the previously existing Contract Documents, the Work shall be executed in accordance with such additional drawings or instructions without additional cost or extension of the Contract Time. If the Contractor claims additional cost or time on account of such additional drawings or instructions, the Contractor shall give the notice provided in Subparagraph 4.3.7.

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

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

4.3 CLAIMS AND DISPUTES

4.3.1 Definition. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" includes Change

Order requests by the Contractor as well as other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Decision of Architect. Claims arising prior to final payment or the earlier termination of the Contract shall be referred initially to the Architect for action as provided in Paragraph 4.4. Action by the Architect, as provided in Paragraph 4.4, shall be required as a condition precedent to arbitration of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due. Action by the Architect in response to a Claim shall not be a condition precedent to arbitration in the event (1) the position of Architect is vacant; (2) the Architect has failed to take action as required under Subparagraph 4.4.1 within 15 days after the Claim is made; (3) the Architect has failed to take action required under Subparagraph 4.4.4 within 30 days after the Claim is made, unless the Architect has notified the parties in writing of the reasons why action could not be taken within 30 days, and of the date by which action will be taken; or (4) the Claim relates to a mechanic's lien.

4.3.3 Time Limits on Claim. Claims by either party must be made within 35 days after occurrence of the event giving rise to such Claim or within 35 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. Claims must be made by written notice. Any change or addition to a previously made Claim shall be made by timely written notice in accordance with this Subparagraph 4.3.3.

4.3.4 Continuing Contract Performance. Pending final resolution of a Claim including arbitration, unless otherwise agreed in writing the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.5 Waiver of Claims: Final Payment. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

Any Claim which has not been waived in accordance with this Subparagraph shall be deemed to have accrued upon discovery by the Owner of the condition or breach upon which such Claim is based, for the purpose of any applicable statute of limitation.

4.3.6 Claims for Differing Subsurface or Latent Physical Conditions. If, during the progress of the Work, the Contractor or the Owner discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the Contract Documents, either the Contractor or the Owner may request

an equitable adjustment in the Contract Sum applying to Work affected by the differing site conditions. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a Contractor, or upon its own initiative, the Owner shall make an investigation of such physical conditions, and, if they differ substantially or materially from those shown on the plans or indicated in the Contract Documents or from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the plans and Contract Documents and are of such a nature as to cause an increase or decrease in the cost of performance of the Work or a change in the construction methods required for the performance of the Work which results in an increase or decrease in the cost of the Work, the Owner shall make an equitable adjustment in the Contract Sum and the Contract shall be modified in writing accordingly.

4.3.6.1 Should conditions encountered below the surface of the ground require that footings, foundations or other parts of the building or other structure be raised, lowered or changed, or if additional depth of excavation below the levels shown on the Drawings is required in order to provide proper bearing for the building or other structure or for any permanent utilities on the site or for permanent grading or other permanent site work, any change in the amount of excavation, dewatering, sheeting, protection, rock excavation, backfill, concrete or other structural work, or any other work permanently incorporated in the building shall be considered a change in the Work, and the Contract Sum shall be adjusted as provided in this Article, provided that the Work has been ordered in writing as provided in 7.1.1.

4.3.7 Claims for Additional Cost or Time. If the Contractor claims that any acts or omissions of the Owner or the Architect, including any instructions or orders, whether oral, written, by Drawings, or otherwise, involve extra cost or time, and the Contractor has not received a written acknowledgment by the Owner or Architect that extra payment will be made or time extended on account thereof, the Contractor shall promptly so notify the Architect in writing of such Claim and shall not proceed with the Work relating to such Claim until the Contractor has received a further written order to proceed except, as provided in Paragraph 10.3, in the case of an emergency affecting life or property. No Claim by the Contractor on account of such acts, omissions, instructions or orders shall be valid unless the Contractor has so notified the Architect before proceeding, and has received the further written order to proceed.

4.3.7.1 OMITTED

4.3.7.2 The Contractor shall have the burden of demonstrating the effect of the claimed act or omission on the Contract Sum or Contract Time, and shall furnish the Architect with such documentation relating thereto as the Architect may reasonably require. In the case of a continuing act or omission only one Claim is necessary.

4.3.7.3 Adverse weather conditions shall not be the basis for a Claim for additional time or cost.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of

the other party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in Subparagraph 4.3.7.

4.4 REVIEW OF CLAIMS BY ARCHITECT

4.4.1 The Architect shall take one or more of the following actions within ten days of receipt of a Claim: (1) defer any action with respect to all or any part of a Claim and request additional information from either party; (2) decline to render a decision for any reason which he deems appropriate (including but not limited to the fact that the Claim involves allegations of fault on the part of the Architect); (3) render a decision on all or a part of the Claim, or (4) submit a schedule to the parties indicating when the Architect expects to take action. The Architect shall notify the parties in writing of any action taken with respect to such Claim. If the Architect renders a decision or declines to render a decision, either party may proceed in accordance with Paragraph 4.5. If the Architect decides that the Work relating to such Claim should proceed regardless of his disposition of such Claim, the Architect shall issue to the Contractor a written order to proceed. The Contractor shall proceed as instructed, and all rights of both parties with respect to such Claim shall be deemed to have been reserved.

4.4.2 If a Claim is resolved by agreement of the parties, the Architect will prepare or obtain appropriate documentation indicating the parties' agreement to the resolution. In the absence thereof the Claim shall be treated as not resolved.

4.4.3 If a Claim has not been resolved, the party making the Claim shall, within ten days after the Architect's request, take one or more of the following actions: (1) submit additional supporting data requested by the Architect; (2) modify the initial Claim; (3) respond to the Architect's action under paragraph 4.4.1; or (4) notify the Architect that the initial Claim stands. Upon receipt of the response or supporting data, the Architect will either reject or approve the claim in whole or in part.

4.5 ARBITRATION

4.5.1 Controversies and Claims Subject to Arbitration. Any Claim arising out of or related to the Contract, or the breach thereof, except claims relating to aesthetic effect, shall be settled by arbitration, subject to the foregoing provisions of paragraph 4.4 and the provisions of Subparagraph 4.5.7. Arbitration will be conducted in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association and judgment upon the award rendered by the Arbitrator or Arbitrators may be entered in any Court having jurisdiction thereof. In any such arbitration in which the amount stated in the demand is \$100,000 or less, a single arbitrator shall be appointed in accordance with the procedures set forth in the American Arbitration Association Construction Industry Arbitration Rules. In any such arbitration in which the amount stated in the demand is in excess of \$100,000, a panel of three arbitrators shall be appointed in accordance with the procedures set forth in the American Arbitration Association Construction Industry Arbitration Rules.

4.5.2 Rules For Arbitration. The parties may agree to any arbitration forum. If unable to agree, by default the forum shall be the American Arbitration Association. If the neutral arbitrator(s) is/are appointed by the American Arbitration Association, the said Association shall administer the arbitration and its Construction Industry Arbitration Rules shall govern all aspects of the proceeding including the enforcement of any award. If the neutral arbitrator(s) is/are not appointed by the American Arbitration Association, then the arbitrator(s) shall act as the administrator of the arbitration but the Construction Industry Arbitration Rules of the Association shall nonetheless govern all aspects of the proceeding, including the enforcement of any award. The arbitration panel shall have all of the powers and duties conferred on the Association pursuant to said rules.

In addition, the following rules shall govern the selection of arbitrators and the proceedings:

4.5.2.1 Neither party may appoint as arbitrator an employee or an owner of that party, nor the parent, spouse or child of an employee or owner of that party.

4.5.2.2 After the neutral arbitrator has been appointed, neither party may engage in ex parte communication with the arbitrator appointed by that party.

4.5.3 Contract Performance During Arbitration. During arbitration proceedings, the Owner and Contractor shall comply with Subparagraph 4.3.4.

4.5.4 When a written decision of the Architect states that the decision is final, any demand for arbitration of the matter covered by such decision must be made within two months after substantial completion of the project, as determined by the Architect in accordance with paragraph 9.8.2 hereof. The failure to demand arbitration within said two month period will result in the Architect's decision becoming final and binding upon the Owner and the Contractor.

4.5.4.1 A demand for arbitration shall be made within the time limits specified in Subparagraph 4.5.4, and in no event shall be made after the date when the institution of legal or equitable proceedings based on such Claim would be barred by the applicable statute of limitations.

4.5.5 Claims and Timely Assertion of Claims. A party who files a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded. When a party fails to include a Claim through oversight, inadvertence or excusable neglect, or when a Claim has matured or been acquired subsequently, the arbitrator or arbitrators may permit amendment.

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

4.5.7 Notwithstanding any provision contained in this Paragraph 4.5 or elsewhere in the Contract Documents, the Owner reserves the following rights in connection with Claims and disputes between the Owner and the Contractor:

- .1 the right to institute legal action against the Contractor in any court of competent jurisdiction in lieu of demanding arbitration pursuant to this Paragraph 4.5, in which case the dispute or disputes which are the subject of such action shall be decided by such court, and not by arbitration;
- .2 the right to obtain from any court of competent jurisdiction a stay of any arbitration instituted by the Contractor, provided that the application for such stay is made before the appointment of the neutral arbitrator in such arbitration, in which case the dispute or disputes which are the subject of such arbitration shall be decided by such court, and not by arbitration;
- .3 the right to require the Contractor to join as a party in any arbitration between the Owner and the Architect relating to the Project, in which case the Contractor agrees to be bound by the decision of the arbitrator or arbitrators in such arbitration.

In case the Owner elects to proceed in accordance with 4.5.7.1 or 4.5.7.2 above, the word "litigation" shall be deemed to replace the word "arbitration" wherever the latter word appears in the Contract Documents.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITIONS

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

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

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

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the

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

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection, unless otherwise required by law to do so.

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

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

5.2.5 The form of each filed Subcontract shall be submitted to the Owner for its acceptance, which shall not be unreasonably withheld or delayed. The form of subcontract shall be that set forth in Mass. Gen. Laws Chapter 149, Section 44F. Each Subcontract shall expressly provide for the contingent assignment referred to in Paragraph 5.4.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and Architect, including without limitation the obligations set forth in Paragraph 3.18. Each Subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that Subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed Subcontract agreement which may be at

variance with the Contract Documents. Subcontractors shall similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Paragraph 14.2 and only for those Subcontract agreements which the Owner accepts by notifying the Subcontractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

ARTICLE 6

CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTS

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

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

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

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

6.2 MUTUAL RESPONSIBILITY

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

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

6.2.3 Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor.

6.2.4 The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in Subparagraph 10.2.5. If such separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor, who shall defend such proceedings at the Contractor's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration costs which the Owner has incurred.

6.2.5 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Paragraph 4.3 provided the separate contractor has reciprocal obligations.

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

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.15, the Owner may clean up and allocate the cost among those responsible as the Architect determines to be just.

ARTICLE 7

CHANGES IN THE WORK

7.1 CHANGES

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

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

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

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

7.2 CHANGE ORDERS

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

- .1 a change in the Work;
- .2 the amount of the adjustment in the Contract Sum, if any; and
- .3 the extent of the adjustment in the Contract Time, if any.

7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

7.3.3.1 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods, as selected by the Owner:

- (a) By unit prices stated in the Contract Documents or otherwise mutually agreed upon.
- (b) By Cost and Percentages (as defined below) estimated by the Contractor as provided in Subparagraph 7.3.3 and accepted by the Owner; the Contractor's estimate shall become a fixed price which shall not be changed by any variation in the actual cost of executing the Work covered by the change.
- (c) By actual Cost determined after the Work covered by the change is completed, plus Percentage.
- (d) By use of the dispute resolution procedures set forth in Paragraph 4.3.

As used in this Paragraph 7.3, "Cost" shall mean the estimated or actual net increase or decrease in cost to the Contractor, Subcontractor, or Sub-subcontractor for performing the Work covered by the change, including actual payments for materials, equipment, rentals, expendable items, wages and associated benefits to workmen and to supervisors employed full time at the site, insurance, bonds and other provable direct costs, but not including any administrative, accounting or expediting costs, or other indirect or overhead costs, or any wages or benefits of supervisory personnel not assigned full time to the site, or any amount for profit or fee to the Contractor, Subcontractor or Sub-subcontractor.

"Percentage" shall mean an allowance to be added to or subtracted from the Cost in lieu of overhead and profit and of any other expense which is not included in the Cost of the Work

covered by the change, as defined above. Percentage for a Sub-subcontractor shall be 10% of any net increase or decrease of Cost of any Work performed by the Sub-subcontractor's own forces plus 5% of any aggregate net increase in Cost of any Work performed for the Sub-subcontractor by other contractors. Percentage for a Subcontractor shall be such percentage allowances for overhead and profit as are set forth in the Subcontract between such Subcontractor and the Contractor. Percentage for the Contractor shall be 9 1/2% of any net increase or decrease of Cost of any Work performed by the Contractor's own forces plus 4 1/2% of any net increase or decrease in the Cost for all other Work covered by the change.

When in the reasonable judgment of the Architect a series of Construction Change Directives or Change Orders effect a single change, Percentage shall be calculated on the cumulative net increase or decrease in Cost, if any.

7.3.3.2 If the Owner elects to determine the cost of the Work as provided in method (a) of sub-Subparagraph 7.3.3.1, the unit prices shall be subject to Subparagraph 7.1.4. Notwithstanding the inclusion of unit prices in the Contract Documents, it shall be the Owner's option to require the Cost of any given change to be determined by one of the other methods stated in 7.3.3.1. If the Owner elects to determine the Cost of the change by unit prices and the nature of the work is such that its extent cannot readily be measured after the completion of such work or any subsequent work, the Contractor shall keep daily records, available at all times to the Architect for inspection, of the actual quantities of such work put in place, and delivery receipts or other adequate evidence, acceptable to the Architect, indicating the quantities of materials delivered to the site for use in such unit price work, and distinguishing such other similar material delivered for use in work included in the base Contract Sum. If so required by the Architect, materials for use in unit price work shall be stored apart from all other materials on the Project.

7.3.3.3 If the Owner elects to determine the cost of the Work as provided in methods (c) or (d) of sub-Subparagraph 7.3.3.1 or if the method of determining the cost has not been established before the Work is begun, the Contractor shall keep detailed daily records of labor and materials costs applicable to the Work.

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

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

7.3.6 If the Owner and Contractor do not agree with the adjustment in Contract Sum or Contract Time or the method for determining the adjustment, the dispute shall be governed by the procedures set forth in Paragraph 4.3.

7.4 MINOR CHANGES IN THE WORK

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

ARTICLE 8

TIME

8.1 DEFINITIONS

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

8.1.2 The date of commencement of the Work is the date established in the Agreement. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

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

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

8.2 PROGRESS AND COMPLETION

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

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance. Unless the date of commencement is established by a notice to proceed given by the Owner, the Contractor shall notify the Owner in writing not less than five days or other agreed period before commencing the Work to permit the timely filing of mortgages, mechanic's liens and other security interests.

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

8.2.4 Within two weeks after award of the Contract, the Contractor shall submit to the Architect a Progress Schedule showing for each class of work the percentage completion to be obtained and the total dollar value of work to be completed as of the first of each month until Substantial Completion.

8.2.5 The Progress Schedule shall be based on an orderly progression of the Work, allowing adequate time for each operation (including adequate time for submission and review of submittals), and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Progress Schedule will be reviewed by the Architect for compliance with the requirements of this Article and will be accepted by the Architect or returned to the Contractor for revision and resubmittal. Unless specifically required by law, no payment under this Contract shall be due until the Progress Schedule has been approved by the Architect.

8.2.6 If in any application for payment as provided for in Paragraph 9.2, the total value of the completed Work in place, as certified by the Architect, is less than 90% of the total value of the Work in place estimated in the Progress Schedule, the Owner may, at the Owner's option, require the Contractor to accelerate the progress of the Work without cost to the Owner by increasing the work force or hours of work, or by other reasonable means approved by the Architect.

8.2.7 If each of three successive applications for payment indicate that the actual Work completed, as certified by the Architect, is less than 90% of the values estimated in the Progress Schedule to be completed by the respective dates, the Owner may at the Owner's option, treat the Contractor's delinquency as a default justifying the action permitted under Paragraph 14.2.

8.2.8 If the Architect has determined that the Contractor should be permitted to extend the time for completion as provided in Paragraph 8.3, the calendar dates in the Progress Schedule shall be adjusted accordingly to retain their same relationship to the adjusted date of Substantial Completion, and the dollar value of Work to be completed as of the first of each month shall be adjusted pro rata.

8.2.9 If the Contractor fails to submit any application for payment in any month, the Architect shall, for the purpose of this evaluation of progress, certify separately to the actual value of the Work in place completed as of the first of the month and to the best of the Architect's knowledge.

8.2.10 Nothing herein shall limit the Owner's right to liquidated or other damages for delays by the Contractor or to any other remedy which the Owner may possess under other provisions of the Contract Documents or by law.

8.2.11 The Progress Schedule required hereunder shall be a CPM Schedule in accordance with the Project Specifications and shall be updated in accordance therewith.

8.3 DELAYS AND EXTENSION OF TIME

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

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

8.3.3 The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Architect on account of any delay in the commencement of the Work and/or any delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise, except as specifically provided in Subparagraphs 2.3.2 and 2.3.3. The Contractor acknowledges that, except as provided therein, the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

8.3.4 No claim for delay shall be allowed on account of failure of the Architect to furnish Drawings, Specifications or instructions or to return Shop Drawings or Samples until the expiration of the applicable time period referred to in Mass. Gen. Laws Chapter 30, Section 39P, and not then unless such claim be reasonable.

8.3.5 No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the maximum amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents, or in equity, should the Contractor assert a quantum meruit claim for the fair value of Contractor's Work, regardless of whether the Contractor is terminated hereunder.

9.2

APPLICATIONS FOR PAYMENT

9.2.1 Within fifteen days after receipt from the Contractor, at the place designated by the Owner if such a place is so designated, of a periodic estimate requesting payment of the amount due for the preceding month, the Owner 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 Owner, less (1) retention based on the Owner's estimate of the fair value of its claims against the Contractor and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of Subparagraph 9.6.2, and less (3) a retention not exceeding five percent of the approved amount of the periodic payment.

9.2.2 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 Owner, less than one percent of the original Contract Sum, or (b) the Contractor substantially completes the work and the Owner takes possession for occupancy, whichever occurs first, the Owner 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 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 Subparagraph 9.6.2, or based on the record of payments by the Contractor to the Subcontractors under this Contract if such record of payment indicates that the Contractor has not paid Subcontractors as provided in Subparagraph 9.6.2. If the Owner fails to make payment as herein provided, there shall be added to each such payment daily interest at the rediscount rate then charged by the Federal Reserve Bank of Boston commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the Contractor; provided, that no interest shall be due, in any event, on the amount due on a periodic estimate for final payment until fifteen days after receipt of such a periodic estimate from the Contractor, at the place designated by the Owner 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.

9.2.3 The Owner 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 Owner 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, Sunday, or holiday shall be the first working day thereafter.

9.2.4 All periodic estimates shall be submitted to the Owner, or to the Owner's representative, and the date of receipt by the Owner or its representative 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 the 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 Owner 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.

9.2.5 The format and number of copies of applications for payment shall be as directed by the Architect. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents.

9.2.5.1 Such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders when such Construction Change Directives have set forth an adjustment to the Contract Sum.

9.2.5.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier because of a dispute or other reason.

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

9.3 The Contractor warrants that title to all Work covered by an application for payment will pass to the Owner either by incorporation in the construction or upon receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens."

9.4 CERTIFICATES FOR PAYMENT

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

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

9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or another contractor;

- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the retainage currently held by the Owner would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 persistent failure to carry out the Work in accordance with the Contract Documents.

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

9.6 PROGRESS PAYMENTS

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

9.6.2 Payments to Subcontractors

9.6.2.1 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.

9.6.2.2 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 Owner as the estimated cost of completing the incomplete and unsatisfactory items of work, shall be due the Subcontractor; and the Owner shall pay that amount to the Contractor. The Contractor shall forthwith pay to the Subcontractor the full amount received from the Owner less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the Contractor.

9.6.2.3 Each payment made by the Owner to the Contractor pursuant to Subparagraphs 9.6.2.1 and 9.6.2.2 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 Owner shall take reasonable steps to compel the Contractor to make each such payment to each such Subcontractor. If the Owner 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 9.6.2.1 and 9.6.2.2, the Owner shall act upon the demand as provided in this section.

9.6.2.4 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 Owner as the estimated cost of completing the incomplete and unsatisfactory items of Work, the Subcontractor may demand direct payment of that balance from the Owner. The demand shall be by a sworn statement delivered to or sent by certified mail to the Owner, 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 Owner 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 Owner and a copy shall be delivered to or sent by certified mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the Subcontract including any amount due for extra labor and materials furnished to the Contractor and of the amount due for each claim made by the Contractor against the Subcontractor.

9.6.2.5 Within fifteen days after receipt of the demand by the Owner, but in no event prior to the seventieth day after substantial completion of the Subcontract work, the Owner 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 Owner 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 Owner 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 9.6.2.4. The Owner 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.

9.6.2.6 The Owner shall forthwith deposit the amount deducted from a direct payment as provided in part (iii) of Subparagraph 9.6.2.5 in an interest-bearing joint account in the names of the Contractor and the Subcontractor in a bank in Massachusetts selected by the Owner 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.

9.6.2.7 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 9.6.2.6 shall be made out of amounts payable to the Contractor at the time of receipt of 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 Owner to the Contractor to the extent of such payment.

9.6.2.8 The Owner shall deduct from payments to the Contractor amounts which, together with the deposits in interest-bearing accounts pursuant to Subparagraph 9.6.2.6, are sufficient to

satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be earmarked for such direct payments, and the Subcontractors shall have a right in such deductions prior to any claims against such amounts by creditors of the Contractor.

9.6.2.9 If the Subcontractor does not receive payments as provided in Subparagraph 9.6.2.1 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 9.6.2.1, the Subcontractor may demand direct payment by following the procedure in Subparagraph 9.6.2.4 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 Owner shall proceed as provided in Subparagraphs 9.6.2.5, 9.6.2.6, 9.6.2.7 and 9.6.2.8.

9.6.3 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, Sub-subcontractor or material supplier, except as provided in Subparagraph 9.6.2, or otherwise as provided by law.

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

9.6.5 "Subcontractor" as used in Sub-subparagraphs 9.6.2.1 through 9.6.2.9 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. "Subcontractor" as used in other provisions of the Contract Documents shall, except as otherwise expressly provided, have the meaning set forth in Subparagraph 5.1.1.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's application for payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended as provided in Article 7.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use and only minor items which can be corrected or completed

without any material interference with the Owner's use of the Work remain to be corrected or completed.

9.8.2 When the Contractor considers that the Work, or a portion thereof designated in the Contract Documents for separate completion, is substantially complete and the premises comply with Subparagraph 3.15.1, the Contractor shall submit to the Architect (1) a list of items to be completed or corrected, (2) all special warranties required by the Contract Documents, endorsed by the Contractor and in a form reasonably acceptable to the Architect and (3) the permits and certificates referred to in Subparagraph 13.5.4. The failure to include any items on the list mentioned in the preceding sentence does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work or designated portion thereof is substantially complete and the other conditions have been met, the Architect will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the date of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.8.3 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage. Such partial occupancy or use may begin whether or not the portion is substantially complete, provided that the respective responsibilities of the Owner and Contractor with respect to payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work, insurance, correction of the Work, and warranties shall be established by agreement of the Owner and Contractor or, absent such agreement, shall be determined by the Architect subject to the right of either party to contest such determination as provided in Paragraph 4.5.

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

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

9.10 FINAL COMPLETION AND FINAL PAYMENT

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

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

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. The making of final payment shall constitute a waiver of claims by the Owner to the extent provided in Subparagraph 4.3.5.

9.10.4 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing

and identified by that payee as unsettled at the time of final application for payment. Such waivers shall be in addition to the waiver described in Subparagraph 4.3.5.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

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

10.2 SAFETY OF PERSONS AND PROPERTY

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

- .1 employees performing the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors;
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction; and
- .4 any other property of the Owner, whether or not forming part of the Work, located at the site or adjacent thereto in areas to which the Contractor has access.

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

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

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

10.2.5 The Contractor shall promptly remedy damage and loss to property referred to in Clauses 10.2.1.2, 10.2.1.3 and 10.2.1.4. If the damage or loss is due in whole or in part to the Contractor's failure to take the precautions required by this Paragraph 10.2, the Contractor shall, subject to any reimbursement to which the Contractor is entitled under the property insurance required by the Contract Documents, bear the cost.

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

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

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

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

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

10.2.11 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, as required by Mass. Gen. Laws Chapter 149, Section 44F(1). The permanent heating and ventilation systems may be used for these purposes when available unless otherwise provided in the Contract Documents.

10.3 EMERGENCIES

10.3.1 In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

10.4 VANDALISM

10.4.1 The Contractor shall be responsible for protecting the work, the work site, materials, and equipment stored at the site (or incorporated in the work), other property at the

site, or other property of the Owner, against vandalism by known or unknown persons. In discharging this obligation the Contractor shall utilize security personnel, measures, procedures, and equipment or materials necessary to prevent vandalism.

10.4.2 In the event of any damage caused by vandalism to the property/materials/equipment/items referenced in the preceding Article 10.4.1, and regardless of whether the Contractor has exercised due care in avoiding same, the Contractor shall be financially responsible therefor to whatever extent said damage is not indemnified by insurance coverage available to either the Contractor or Owner. The Contractor's obligation hereunder shall include payment of damages to whatever extent insurance coverage is unavailable due to self-insurance, a deductible, or a self-insured retention.

10.4.3 Any monies owed by the Contractor to the Owner on account of damages referenced in the preceding Article 10.4.2 may be offset by the Owner against any periodic payments made under the Contract.

ARTICLE 11

INSURANCE AND BONDS

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located and to which the Owner has no reasonable objection such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;
- .2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

- .5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle; and
- .7 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

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

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

11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. These certificates shall set forth evidence of all coverage required by 11.1.1 and 11.1.2. The form of certificate shall be AIA Document G705. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final application for payment as required by Subparagraph 9.10.2.

11.1.4 In addition to Statutory Workers' Compensation Coverage, the Contractor shall provide Employers Liability Coverage at the following limits of liability:

Each accident - \$500,000;

Disease - policy limit \$500,000;

Disease - each employee \$500,000.

11.1.5 The liability insurance coverage purchased by the Contractor in order to comply with Section 11.1.1 (.1-.7) above shall contain the following limits of liability:

- \$3,000,000 - general aggregate;
- \$3,000,000 - products/completed operations aggregate;
- \$1,000,000 - personal injury and advertising;
- \$1,000,000 - each occurrence;
- \$1,000,000 - auto liability including hired and non-owned;
- \$2,000,000 - umbrella.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

11.3 PROPERTY INSURANCE BUILDERS RISK POLICY

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

11.3.1.1 Property insurance shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, false-work, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents. The form of policy for this coverage shall provide for coverage in the event of a loss up to the contemplated value of the property following completion of all Work required under the Contract.

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

11.3.1.3 The property insurance maintained hereunder by the Owner has a deductible of \$100,000 applicable to each/any claim thereunder. In the event of any property damage arising from any occurrence prior to the Architect's issuance of a final Certificate for Payment under Section 9.10.1, including but not limited to property damage arising from vandalism or casualty of any kind, the Contractor shall be responsible for the cost of said property damage: (a) to the extent not indemnified by the Owner's insurance policy because of said deductible; or (b) to the extent not indemnified by the Owner's insurance policy for any other reason.

11.3.1.4 Property insurance for portions of the Work stored off site and in transit shall be procured and the cost borne by the Contractor, unless otherwise provided in the Contract Documents.

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

11.3.3 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused, to the extent covered and paid by insurance under this Subparagraph 11.3.3.

11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be borne by the Contractor.

11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Subparagraph 11.3.7 for damages caused by fire or other perils covered by this separate property

insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Paragraph 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

11.3.7 Waivers of Subrogation. INTENTIONALLY OMITTED.

11.3.8 A loss insured under Owner's property insurance shall be adjusted by the Owner and made payable to the Owner on its behalf and on behalf of the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Subcontractors in similar manner.

11.3.9 If required in writing by a party in interest, the Owner shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties all subject to the requirements, if any, of the Owner's construction and/or permanent lender. The cost of required bonds shall be charged against proceeds received by Owner. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.5.

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

11.4 PERFORMANCE BOND AND PAYMENT BOND

11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract. Said bonds shall satisfy the applicable statutory requirements of the place in which the Work is to be performed.

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

ARTICLE 12

UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

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

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

12.2 CORRECTION OF WORK

12.2.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby and any cost, loss, or damages to the Owner resulting from such failure or defect.

12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under Subparagraph 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the Work. This obligation under this Subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

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

12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Paragraph 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner may upon ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

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

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

12.3 ACCEPTANCE OF NONCONFORMING WORK

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

ARTICLE 13

MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

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

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Except as hereinafter provided, neither party to the Contract shall assign the Contract or sublet it as a whole without the 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 Owner. The Owner may assign the Contract to any institutional lender providing construction or permanent financing for the Project or to any person acquiring the Owner's interest in the Project, and the Contractor agrees to execute all consents, certificates, and other documents required by such lender or other person in connection with such assignment.

13.2.2 If the Owner conveys its interest in the Project to a third party, any rights which the Owner may have against the Contractor arising from this Agreement shall automatically transfer to such third party.

13.3 WRITTEN NOTICE

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

13.4 RIGHTS AND REMEDIES

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

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

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so the Architect may

observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

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

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

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

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

13.6 LIMITATION OF LIABILITY

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

13.7 The Contractor shall comply with any decisions of the Arlington Redevelopment Board applicable to the Project, and with any other Laws, By-Laws, Rules, and Regulations or Ordinances within the Town of Arlington.

ARTICLE 14

TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

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

- .1 issuance of an order of a court or other public authority having jurisdiction; or
- .2 an act of government, such as declaration of national emergency, making material unavailable.

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

14.1.3 If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Subparagraph 14.1.2.

14.2 TERMINATION BY THE OWNER

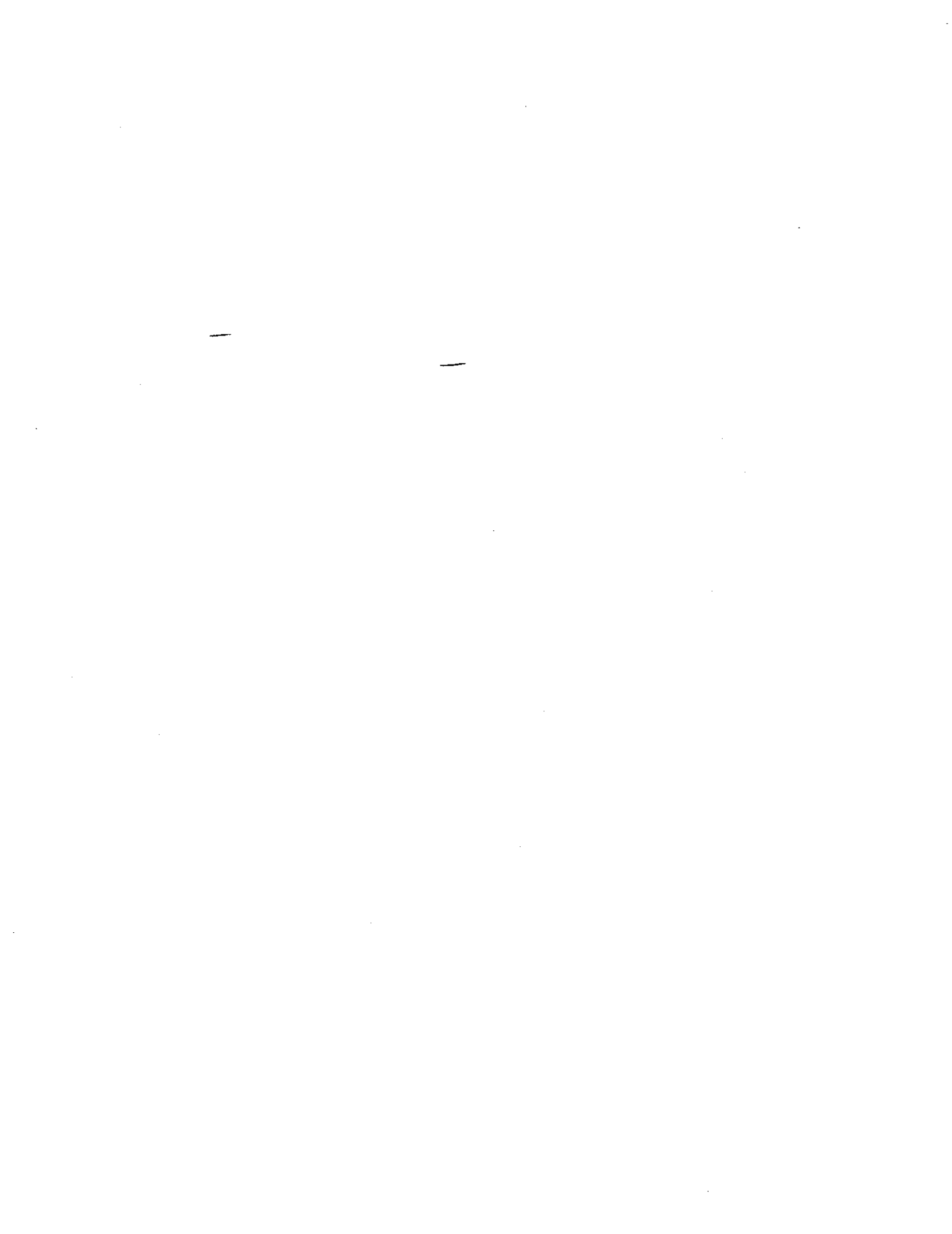
14.2.1 If the Contractor is adjudged a bankrupt, or if the Contractor makes a general assignment for the benefit of the Contractor's creditors, or if a receiver is appointed on account of the Contractor's insolvency, or if the Contractor persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if the Contractor fails to make prompt payment to Subcontractors for materials or labor, or persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a significant violation of any provision of the Contract, including the failure to perform the Work in Accordance With the Contract, then the Contractor shall be in default, and the Owner may, without prejudice to any other right or remedy, and upon seven days' written notice to the Contractor, take possession of all materials, tools, appliances, equipment, construction equipment and machinery and vehicles, offices and other facilities on the Project site, and all

materials intended for the Work, wherever stored, and may terminate the employment of the Contractor, accept assignment of any or all Subcontracts pursuant to Paragraph 5.4, and finish the Work by whatever method the Owner may deem expedient. The Owner shall be entitled to collect from the Contractor all direct, indirect, liquidated, and consequential damages suffered by the Owner on account of the Contractor's default, including without limitation additional services and expenses of the Architect made necessary thereby. The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner's damages have been established, and to apply such amounts to such damages.

14.2.2 When the Owner terminates the Contract for one of the reasons stated in Subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished. Any payment to the Contractor in quantum meruit shall be capped at the amount due under this Contract, including any adjustments, regardless of whether said termination by the Owner is deemed rightful or wrongful.

14.2.3 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

215453.1



SUPPLEMENTAL STATUTORY CONDITIONS

ARTICLE 1 - WAGES AND EMPLOYMENT PRACTICES

- 1.1 Preference To Veterans and Citizens In Public Work; Rate of Wages. (Statutory reference: Mass. Gen. Laws Chapter 149, Section 26) This Paragraph applies to every contract or subcontract for the construction of public works by the Commonwealth or by a county, town or district, or by persons contracting or subcontracting for such works.
- 1.1.1 In the employment of mechanics and apprentices, teamsters, chauffeurs and laborers, preference shall first be given to citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment, who are veterans as defined in Mass. Gen. Laws Chapter 4, Section 7, clause 43, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally who have been residents of the Commonwealth for at least six months at the commencement of their employment, and if they cannot be obtained in sufficient numbers, then to citizens of the United States, and every contract for such work shall contain a provision to this effect. Each county, town or district in the construction of public works, or persons contracting or subcontracting for such works, shall give preference to veterans and citizens who are residents of such county, town or district.
- 1.1.2 The rate per hour of the wages paid to said mechanics and apprentices, teamsters, chauffeurs and laborers in the construction of public works shall not be less than the rate or rates of wages to be determined by the Commissioner of Labor and Industries as hereinafter provided; provided, that the wages paid to laborers employed on said works shall not be less than those paid to laborers in the municipal service of the town or towns where said works are being constructed; provided, further, that where the same public work is to be constructed in two or more towns, the wages paid to laborers shall not be less than those paid to laborers in the municipal service of the town paying the highest rate; provided further, that if, in any of the towns where the works are to be constructed, a wage rate or wage rates have been established in certain trades and occupations by collective agreements or understandings in the private construction industry between organized labor and employers, the rate or rates to be paid on said works shall not be less than the rates so established; provided, further, that in towns where no such rate or rates have been so established, the wages paid to mechanics and apprentices, teamsters, chauffeurs and laborers on public works, shall not be less than the wages paid to the employees in the same trades and occupations by private employers engaged in the construction industry. This section shall also apply to regular employees of the Commonwealth or of a county, town or district, when such employees are employed in the construction, addition to or alteration of public buildings for which special appropriations of more than one thousand

dollars are provided. 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.

1.2

List of Jobs; Classifications; Determination of Rate of Wages; Schedule.
(Statutory reference; Mass. Gen. Laws Chapter 149, Section 27) This Paragraph applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

The Commissioner of Labor and Industries shall prepare, for the use of such public officials or public bodies whose duty it shall be to cause public works to be constructed, a list of the several jobs usually performed on various types of public works upon which mechanics and apprentices, teamsters, chauffeurs and laborers are employed. The Commissioner shall classify said jobs, and he may revise such classifications from time to time, as he may deem advisable. Prior to awarding a contract for the construction of public works, said public official or public body shall submit to the Commissioner a list of the jobs upon which mechanics and apprentices, teamsters, chauffeurs and laborers are to be employed, and shall request the Commissioner to determine the rate of wages to be paid on each job. Said rates shall apply to all persons engaged in transporting gravel or fill to the site of said public works or removing gravel or fill from such site, regardless of whether such persons are employed by a contractor or subcontractor or are independent contractors or owner-operators. The Commissioner, subject to the provisions of Paragraph 1.1 of these Supplementary Statutory Conditions, shall proceed forthwith to determine the same, and shall furnish said official or public body with a schedule of such rate or rates of wages as soon as said determination shall have been made. In advertising or calling for bids for said works, the awarding official or public body shall incorporate said schedule in the advertisement or call for bids by an appropriate reference thereto, and shall furnish a copy of said schedule without cost, to any person requesting the same. Said schedule shall be made a part of the contract for said works and shall continue to the minimum rate or rates of wages for said employees during the life of the contract. Any person engaged in the construction of said works shall cause a legible copy of said schedule to be kept posted in a conspicuous place at the site of said works during the life of the contract. The aforesaid rates of wages in the schedule of wage rates shall include payment by employers to health and welfare plans, pension plans, and supplementary unemployment benefit plans 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. Note: The awarding authority does not guarantee the accuracy of any schedule of wage rates

furnished to the Contractor hereunder, and the Contractor shall be responsible for ascertaining the prevailing wages in the area where the work will be performed.

1.3 Employment Records To Be Kept By Contractor, Subcontractor; Statement of Compliance. (Statutory reference; Mass. Gen. Laws Chapter 149, Section 27B) This Paragraph applies to every contract or subcontract for the construction of public works by the Commonwealth, or by a county, town or district.

Every Contractor, Subcontractor or public body engaged in said public works to which Paragraph 1.2 of these Supplementary Statutory Conditions applies shall keep a true and accurate record of all mechanics and apprentices, teamsters, chauffeurs and laborers employed thereon, showing the name, address and occupational classification of each such employee on said works, and the hours worked by, and the wages paid to, each such employee, and shall furnish to the Commissioner of Labor and Industries, upon his request, a copy of said record, signed by the employer or his authorized agent under the penalties of perjury. Such records shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time, and as often as may be necessary.

Each such Contractor, Subcontractor or public body shall preserve its payroll records for a period of three years from the date of completion of the contract.

Each such Contractor, Subcontractor or public body shall furnish to the Commissioner of Labor and Industries within fifteen days after completion of its portion of the work a statement, executed by the Contractor, Subcontractor, or public body or by any authorized officer or employee of the Contractor, Subcontractor or public body who supervises the payment of wages in the following form:

STATEMENT OF COMPLIANCE _____, 2004

I, _____, _____ do hereby state:
(Name of signatory party) (Title)

That I pay or supervise the payment of the persons employed by (Contractor, Subcontractor or public body) _____ on the _____ and that all mechanics (building or project) 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

The above mentioned copies of payroll records and statements of compliance shall be available for inspection by any interested party filing a written request to the Commissioner for such inspection.

- 1.4 **Wages Paid to Operators of Trucks and Other Equipment.** (Statutory reference: Mass. Gen. Laws Chapter 149, Section 27F) This Paragraph applies to every contract for the construction of public works by the Commonwealth, or by a county, city, town or district.

Prescribed rates of wages, as determined by the Commissioner of Labor and Industries, shall be paid to the operators of all trucks, vehicles or equipment employed on the Project. Said rates of wages shall be requested of said Commissioner by the awarding authority and shall be furnished by the Commissioner in a schedule containing the classification of jobs, and the rate of wages to be paid for each job. Said rates of wages shall include payments to health and welfare plans, or, if no such plan is in effect between employer and employees, the amount of such payments shall be paid directly to said operators.

- 1.5 **Reserve Police Officers** (Statutory reference: Mass. Gen. Laws. Chapter 149, Section 27B) This Paragraph 1.5 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public works for the Commonwealth or any political subdivision thereof.

The Contractor shall pay to any reserve police officer employed by him in any city or town the prevailing rate of wage paid to regular police officers in such city or town.

- 1.6 **Eight-Hour Day, etc.** This Paragraph 1.6 applies only to contracts which are subject to the provisions of Mass. Gen. Laws Chapter 149, Sections 30 and 34.

No laborer, worker, mechanic, foreman or inspector working within this Commonwealth in the employ of the Contractor, Subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency.

- 1.7 **Lodging, etc.** (Statutory reference: Mass. Gen. Laws Chapter 149, Section 25) This Paragraph applies to every contract with the Commonwealth, a county, city or town, or with a department, board, commission, or officer acting therefor, for the doing of public work.

Every employee under this contract shall lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall, either directly or indirectly, require as a condition of the employment of any

person that the employee shall lodge, board or trade at a particular place or with a particular person.

- 1.8 Access to Contractor's Records (Executive Order No. 195) This paragraph applies to every contract for the purchase of services or material by any agency, bureau, board, commission, institution, or department of the Commonwealth.

The Governor or his designee, the secretary of administration and finance, and the state auditor or his designee shall have the right at reasonable times and upon reasonable notice to examine the books, records, and other compilations of data of the Contractor which pertain to the performance and requirements of this contract.

- 1.9 Worker's Compensation Insurance (Statutory reference: Mass. Gen. Laws Chapter 149, Section 34A) This Paragraph 1.9 applies to every contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or other public works for the Commonwealth or any political subdivision thereof.

The Contractor shall, before commencing performance of the contract, provide by insurance for the payment of compensation and the furnishing of other benefits under Mass. Gen. Laws Chapter 152 to all persons to be employed under the contract, and the Contractor shall continue such insurance in full force and effect during the term of the contract. Sufficient proof of compliance with this Paragraph 1.9 must be furnished at the time of execution of this contract. Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof. No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the awarding authority at least fifteen days prior to the intended effective date thereof, which date shall be expressed in full notice.

ARTICLE 2 - EQUAL EMPLOYMENT OPPORTUNITY AND AFFIRMATIVE ACTION

(Statutory reference: Mass. Gen. Laws Chapter 151B; Executive Orders No. 74, No. 116 and No. 246). The provisions of this Article 2 are intended to comply with the Commonwealth's Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program, referred to in Executive Order No. 116 and administered by the Massachusetts Commission Against Discrimination. If no specific percentage has been inserted in Subparagraph 2.2.3 below, the applicable minimum percentage provided for in such Supplemental Program shall be deemed to have been so inserted.

- 2.1 Definitions. For purposes of this Contract, "minority" refers to Asian-Americans, Blacks, Spanish-Surnamed Americans, North American Indians, and Cape Verdeans. "Commission" refers to the Massachusetts Commission Against Discrimination.

- 2.2 **Non-Discrimination and Affirmative Action Requirements.** During the performance of this Contract, the Contractor and all of his Subcontractors (hereinafter "Contractor"), for himself, his assignees and successors in interest, agree to comply with Subparagraphs 2.2.1 through 2.2.11.
- 2.2.1 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, age or sex. The aforesaid provision shall include, but not be limited to, the following: employment upgrading, demotion, or transfer; recruitment advertising; recruitment layoff; termination; rates of pay or other forms of compensation; conditions or privileges of employment; and selection for apprenticeship. The Contractor shall post hereafter in conspicuous places, available for employees and applicants for employment, notices to be provided by the Commission setting forth the provisions of the Fair Employment Practices Law of the Commonwealth.
- 2.2.2 In connection with the performance of Work under this Contract, the Contractor shall undertake in good faith affirmative action measures designed to eliminate any discriminatory barriers in the terms and conditions of employment on the grounds of race, color, religious creed, national origin, age or sex, and to eliminate and remedy any effects of such discrimination in the past. Such affirmative action shall entail positive and aggressive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation, and in-service or apprenticeship training programs. This affirmative action shall include all action required to guarantee equal employment opportunity for all persons, regardless of race, color, religious creed, national origin, age or sex. A 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.
- 2.2.3 As part of his obligation of remedial action under the foregoing Subparagraph 2.2.2, the Contractor shall maintain on this project a not less than ten percent (10%) ratio of minority employee man hours to total man hours in each job category including but not limited to bricklayers, carpenters, cement masons, electricians, ironworkers, operating engineers, and those "classes of work" enumerated in Mass. Gen. Laws Chapter 149, Section 44F.
- 2.2.4 In the hiring of minority journeymen, apprentices, trainees and advanced trainees, the Contractor shall rely on referrals from a multi-employer affirmative action program approved by the Commission, traditional referral methods utilized by the construction industry, and referrals from agencies, not more than three in number at any one time, designated by the Liaison Committee (described in Subparagraph 2.2.5 below) or the Commission.

- 2.2.5 At the discretion of the Commission there may be established for the life of this 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 this project, hereinafter called the administering agency, the Commission and such other representatives as may be designated by the Commission in conjunction with the administering agency.
- 2.2.6 The Contractor (or his agent, if any, designated by him as the on-site equal employment opportunity officer) shall recognize the Liaison Committee as an affirmative action body, and shall establish a continuing working relationship with the Liaison Committee, consulting with the Liaison Committee on all matters related to minority recruitment, referral, employment and training.
- 2.2.7 The Contractor shall prepare projected manning tables on a quarterly basis. These shall be broken down into projections, by week, of workers required in each trade. Copies shall be furnished one week in advance of the commencement of the period covered, and also when updated, to the Commission and Liaison Committee.
- 2.2.8 Records of employment referral orders, prepared by the Contractor, shall be made available to the Commission and to the Liaison Committee on request.
- 2.2.9 The Contractor shall prepare weekly reports in a form approved by the Commission of hours worked in each trade by each employee, identified as a minority or non-minority. Copies of these shall be provided at the end of each week to the Commission and to the Liaison Committee.

If the Contractor shall use any Subcontractor on any work performed under this Contract, he shall take affirmative action to negotiate with qualified minority Subcontractors. This affirmative action shall cover both pre-bid and post-bid periods. It shall include notification to the Office of Minority Business Assistance (within the Executive Office of Communities and Development) or its designee, while bids are in preparation, of all products, work or services for which the Contractor intends to negotiate bids.

In the employment of journeymen, apprentices, trainees and advanced trainees, the Contractor shall give preference, first, to citizens of the Commonwealth who have served in the armed forces of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to the perform the work to which the employment relates, and, secondly, to citizens of the Commonwealth generally, and, if such cannot be obtained in sufficient numbers, then to citizens of the United States.

A designee of the Commission and a designee of the Liaison Committee shall each have right of access to the construction site.

2.2.10 The Contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and each individual filed sub-bid contract.

A Labor Scheduling Table will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract. Said Labor Scheduling Table shall be in a form acceptable to the Town.

2.2.11 Before starting work, the Contractors (includes the General Contractor, for itself and its Subcontractors, as well as all filed sub-bid Contractors) will submit plans for achievement of the equal opportunity goals of the contract. All Contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the Contractors expect to achieve the requirements during the first quarter. If there are reasons why the Contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the Contractors shall provide a plan calculated to address, to the extent reasonably possible, these obstacles to a good faith effort to achieve such goals.

Not more than ten days following the end of each work quarter, the Contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.

All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.

2.3 The Contractor shall comply with the provisions of Executive Order No. 74, as amended by Executive Order No. 166, dated May 1, 1975, and of Mass. Gen. Laws Chapter 151B, both of which are herein incorporated by reference and made a part of this Contract.

2.4 The Contractor, in the performance of all Work, and prior to completion of the Work, will not discriminate on grounds of race, color, religious creed, national origin, age or sex in employment practices, in the selection or retention of Subcontractors, or in the procurement of materials and rentals of equipment.

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

2.6 The Contractor hereby certifies that he shall comply with the minority manpower ratio and specific action steps contained herein. The Contractor shall be required to obtain from each of its Subcontractors and submit to the administering agency

prior to the performance of any work under the Contract a certification by said Subcontractor, regardless of tier, that it will comply with the minority manpower ration and specific affirmative action steps contained herein. Such certification shall be provided on forms furnished by the administering agency or, in the absence thereof, on forms prescribed by the Commission.

2.7 The Contractor's certification form must be signed by all successful low bidder(s) prior to award by the administering agency.

2.8 Compliance Information, Reports and Sanctions.

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

2.8.2 Whenever the administering agency, the Commission or the Liaison Committee believes the Contractor or any Subcontractor may not be operating in compliance with the terms of this Paragraph 2.8, the Commission directly, or through its designated agent, shall conduct an appropriate investigation, and may confer with the parties, to determine if such Contractor is operating in compliance with the terms of this Paragraph 2.8. If the Commission or its agent finds the Contractor or any Subcontractor not in compliance, it shall make a preliminary report on noncompliance, and notify such Contractor in writing of such steps as will in the judgment of the Commission or its agent bring such Contractor into compliance. In the event that such Contractor fails or refuses to fully perform such steps, the Commission shall make a final report of non-compliance, and recommend to the administering agency the imposition of one or more of the sanctions listed below. If, however, the Commission believes the Contractor or any Subcontractor has taken or is taking every possible measure to achieve compliance, it shall not make a final report of non-compliance. Within fourteen days of the receipt of the recommendations of the Commission, the administering agency shall move to impose one or more of the following sanctions, as it may deem appropriate to attain full and effective enforcement:

- (i) The recovery by the administering agency from the Contractor of 1/100 of 1% of the contract award price or \$1,000, whichever sum is greater, in the nature of liquidated damages or, if a Subcontractor is in non-compliance, the recovery by the administering agency from the Contractor, to be assessed by the Contractor as a back charge against

the Subcontractor, of 1/10 or 1% of the subcontract price, or \$400, whichever sum is greater, in the nature of liquidated damages, for each week that such party fails or refuses to comply;

- (ii) The suspension of any payment or part thereof due under the Contract until such time as the Contractor or any Subcontractor is able to demonstrate his compliance with the terms of the contract;
- (iii) The termination, or cancellation, of the Contract, in whole or in part, unless the Contractor or any subcontractor is able to demonstrate within a specified time his compliance with the terms of the Contract;
- (iv) The denial to the Contractor or any Subcontractor of the right to participate in any future contracts awarded by the administering agency for a period of up to three years.

If at any time after the imposition of one or more of the above sanctions a Contractor is able to demonstrate that he is in compliance with this Paragraph 2.8, he may request that the administering agency, in consultation with the Commission, suspend the sanctions conditionally, pending a final determination by the Commission as to whether the Contractor is in compliance. Upon final determination of the Commission, the administering agency, based on the recommendation of the Commission, shall either lift the sanctions or reimpose them.

Sanctions enumerated under Subparagraph 2.8.2 of this Paragraph 2.8 shall not be imposed by the administering agency except after an adjudicatory proceeding, as that term is used in Mass. Gen. Laws Chapter 30A, has been conducted. No investigation by the Commission or its agent shall be initiated without prior notice to the Contractor.

2.9 Severability. The provisions of this Article 2 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.

2.10 The Contractor shall comply with the provisions of Executive Order No. 246, relating to discrimination against and equal employment opportunity for the handicapped, which is herein incorporated by reference and made a part of this Contract. In connection with the performance of work under this Contract, the Contractor, Subcontractors and suppliers of goods and services shall not discriminate against the handicapped. Furthermore, Contractors, Subcontractors and suppliers of goods and services must give written notice of their commitments under this Paragraph 2.10 to any labor union, association or brotherhood with which they have a collective bargaining contract or other agreement, and must give such notice to handicapped contractors and to handicapped contractor

associations. A copy of such notice must be furnished to the awarding authority at the time of the signing of the contract.

- 2.11 Suspension of Payments.
- 2.11.1 If the awarding authority determines after investigation that the Contractor or any Subcontractor is not in compliance with the terms of Article 2, it may suspend any payment or portion thereof due under the Contract until the Contractor demonstrates compliance with the terms of Article 2.
- 2.11.2 Payment shall not be suspended if the awarding authority finds that the Contractor made his best efforts to comply with Article 2, or that some other justifiable reason exists for waiving the provisions of Article 2 in whole or in part.
- 2.11.3 Payment may be suspended only after the Contractor and any other interested party shall have been given the opportunity to present evidence in support of its position at an informal hearing held by the awarding authority and the awarding authority has concluded upon review of all the evidence that such penalty is justified.
- 2.11.4 This temporary suspension of payments by the awarding authority is separate from the sanctions set forth in Paragraph 2.8 above, which are determined by the Commission and recommended to the awarding authority.

ARTICLE 3 - MASSACHUSETTS PUBLIC CONSTRUCTION STATUTES

- 3.1 To whatever extent Massachusetts statutory laws regarding public construction apply to this project, said laws specifically are incorporated herein as if re-stated herein.

ARTICLE 4 - TITLE I GENERAL GOVERNMENT, ARTICLE 16 CONSTRUCTION PROJECTS, § 1-3 OF THE TOWN OF ARLINGTON GENERAL BY-LAWS

- 4.1 Women Work Force Participation.
- 4.1.1 The contractor shall maintain as a goal on this project a not less than five percent ratio of women work force to total project hours in both the general contract and each individual filed sub-bid contract, if applicable. The preceding sentence shall be included in all construction contracts whether entered into by the Town pursuant to the provisions of M.G.L. c. 149 or M.G.L. c. 30, § 39M et. seq. provided however, that if entered into under Chapter 30 same shall not be deemed to apply where the projected bid price as determined by the Director of Public Works is not likely to exceed \$200,000.

- 4.1.2 A Labor Scheduling Table which will be used as a tool for achieving a range of women work force participation for the entire project in both the general contract and each individual filed sub-bid contract.
- 4.2 Equal Opportunity Goal Compliance.
- 4.2.1 Before starting work, the contractors (includes the general contractor, for itself and its subcontractors, as well as all filed sub-bid contractors, if applicable) will submit plans for achievement of the equal opportunity goals of the contract. All contractors will be required to make a good faith effort to achieve these goals. The plan will indicate if the contractors expect to achieve the requirements during the first quarter. If there are reasons why the contractors do not expect to achieve the requirements during the first quarter year of the contract construction phase, then the contractors shall provide a plan calculated to address, to the extent reasonably possible, these obstacles to a good faith effort to achieve such goals.
- 4.2.2 Not more than ten days following the end of each work quarter, the contractors will report on the achievement of the goals, detailing the good faith efforts that have been made and will continue to be made and any other appropriate efforts not yet undertaken.
- 4.2.3 All reports will be signed by an officer or principal of the company who has the authority to contractually obligate the company.
- 4.3 Recruitment and Training
- 4.3.1 Any board, officer, committee, or other agency of the Town, which acts on behalf of the Town in making or supervising any contract, in any amount exceeding the sum of \$100,000 for the purchase of goods or services or for the construction, renovation, or repair of buildings or other improvement of real estate, may make arrangements with contractors and other interested agencies for special programs of recruitment and training in connection with the work to be performed on such contract, with the objective of promoting equal employment opportunity for members of minority groups protected by the fair employment laws of the Commonwealth and the United States. Any board, officer, committee or other Town agency may expend Town funds in carrying them out provided that appropriations specifically designed for such purposes have been voted by the Town Meeting.

215451.1

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**The Massachusetts Prevailing Wage Law
M.G.L. c. 149, §§26-27**

NOTICE TO AWARDING AUTHORITIES

- The enclosed wage schedule applies only to the specific project listed at the top of the schedule, and these rates will remain in effect for the duration of the project, except in the case of multi-year projects. For projects lasting longer than one year, awarding authorities must request updated rates.
- You should request an updated wage schedule from the Department of Labor Standards if you have not opened bids or selected a contractor within 90 days of the date of issuance of the enclosed wage schedule.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project for which it has been issued.
- Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project.

NOTICE TO CONTRACTORS

- The enclosed wage schedule must be posted in a conspicuous place at the work site during the life of the project.
- The wages listed on the enclosed wage schedule must be paid to employees on public works projects regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- The enclosed wage schedule applies to all phases of the project, including the final clean-up. Contractors whose only role is to perform final clean-up must pay their employees according to this wage schedule.
- All apprentices must be registered with the Massachusetts Division of Apprenticeship Standards (DAS) in order to be paid at the lower apprentice rates. All apprentices must keep his/her apprentice identification card on his/her person during all work hours. If a worker is not registered with DAS, they must be paid the "total rate" listed on the wage schedule regardless of experience or skill level. For further information, please call 617-626-5409, or write to:

DAS
19 Staniford Street, 1st Floor
P.O. Box 146759,
Boston, MA 02114.

**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:

<p>STATEMENT OF COMPLIANCE</p> <p style="text-align: center;">_____, 20____</p> <p>I, _____, _____</p> <p style="text-align: center;">(Name of signatory party) (Title)</p> <p>do hereby state:</p> <p style="text-align: center;">That I pay or supervise the payment of the persons employed by</p> <p>_____ on the _____</p> <p style="text-align: center;">(Contractor, subcontractor or public body) (Building or project)</p> <p>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.</p> <p style="text-align: right;">Signature _____</p> <p style="text-align: right;">Title _____</p>	
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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	Employee is OSHA 10 Certified (?)	Work Classification:	Appr. Rate (%)	Worked Hours							Project Hours (A) All Other Hours	Hourly Base Wage (B)	Health & Welfare Insurance (C')	ERISA Pension Plan (D)	Supp. Unemp. (E)	(B+C+D+E) Total Hourly Prev. Wage (F)	(A x F) Project Gross Wages (G) Total Gross Wages	Check No. (H)
				Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.								

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.

Date recieved by awarding authority / /
--



Office of the Superintendent
Arlington High School
P.O. Box 167
869 Massachusetts Avenue
Arlington, MA 02476-0002

Telephone
(781) 316-3500
Fax
(781) 316-3509

CRIMINAL OFFENDER RECORD INFORMATION (CORI) ACKNOWLEDGEMENT FORM

ARLINGTON PUBLIC SCHOOLS is registered under the provisions of MGL c.6, §172 to receive CORI for the purpose of screening current and otherwise qualified prospective employees, subcontractors, volunteers, license applicants, current licensees, and applicants for the rental or lease of housing.

As a prospective or current employee, subcontractor, volunteer, license applicant, current licensee, or applicant for the rental or lease of housing, I understand that a CORI check will be submitted for my personal information to the DCJIS. I hereby acknowledge and provide permission to **ARLINGTON PUBLIC SCHOOLS** to submit a CORI check for my information to the DCJIS. This authorization is valid for one year from the date of my signature. I may withdraw this authorization at any time by providing **ARLINGTON PUBLIC SCHOOLS** with written notice of my intent to withdraw consent to a CORI check.

FOR EMPLOYMENT, VOLUNTEER, AND LICENSING PURPOSES ONLY: The **ARLINGTON PUBLIC SCHOOLS** may conduct subsequent CORI checks within one year of the date this form was signed by me provided, however, that **ARLINGTON PUBLIC SCHOOLS** must first provide me with written notice of this check.

By signing below, I provide my consent to a CORI check and acknowledge that the information provided on Page 2 of this Acknowledgement Form is true and accurate.

Signature

Date

An Equal Opportunity School System with a High Commitment to Diversity

School: _____

Please check one of the following:

New Employee _____
Current Employee _____
Volunteer _____
Subcontractors _____

SUBJECT INFORMATION:

Last Name	First Name	Middle Name	Suffix
-----------	------------	-------------	--------

Maiden Name (or other name(s) by which you have been known)

Date of Birth

Place of Birth

Last Six Digits of Your Social Security Number: _____ - _____

Sex: _____ Height: ___ ft. ___ in. Eye Color: _____ Race: _____

Driver's License or ID Number: _____ State of Issue: _____

Mother's Maiden Name

Father's Full Name

Current and Former Addresses:

Street Number & Name	City/Town	State	Zip
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Street Number & Name	City/Town	State	Zip
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DO NOT WRITE BELOW THIS LINE

For Office Use:

The above information was verified by reviewing the following form(s) of government issued identification:

VERIFIED BY: Ruth Bennett –Town of Arlington

Name of Verifying Employee (Please Print)

Signature of Verifying Employee

OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA

SECTION 01 11 00
SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Without limitation, the Project includes following:
1. The work consists of demolition of existing roof-top unit and replacement with new gas fired, packaged, multi-zoned rooftop unit. The new rooftop unit shall be properly tested, balanced and ready for operation, including necessary minor details and accessories required to make the work complete.
 2. The existing roof-top unit shall remain operational until replacement unit is ready for installation and the date has been approved by Owner.
- B. Completeness: The Work shall be as shown on the Contract Documents and in conformance with all applicable requirements of the governing laws and codes, and be complete and functional in every respect for intended uses.
1. **All Work mentioned or indicated in the Contract Documents shall be provided as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be provided by others. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all. For example, any item indicated in the Specifications which is omitted from the Drawings or vice versa shall be construed as though contained in both. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of Work unless otherwise directed by written addendum to the Contract.**

1.2. SUBSTANTIAL COMPLETION DATE:

- A. The successful bidder, upon execution of the Contract shall commence the Work of the Contract Agreement within seven (7) calendar days after said execution of the Contract Agreement, and shall thereafter diligently and continuously carry on the Work in such manner as to substantially complete the Work of this Contract on or before December 1, 2018.

1.3 CONTRACTOR'S USE OF PREMISES

- A. Prior to beginning work of the Contract, the Contractor shall meet with the Owner to determine procedures regarding access to and use of site, staging, parking, and storage areas, special site conditions, hours of operations, truck routes and any other restrictions regarding the use of the site areas surrounding the construction.
- B. The Contractor shall keep all public and private access roads and walks clear of debris caused by this work during the entire term of the Contract. At no additional cost to the Owner, the Contractor shall repair all public and private streets, drives, curbs, walks, site work, interior finishes, other improvements and existing construction where disturbed by work of, or related to, construction operations under this Contract, leaving them in as good condition after completion of the work as before construction operations started.
- C. Emergency access roads, fire-lanes and means of egress on and about the work area shall be kept open and free at all times, for passage of emergency vehicles.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- D. Contractor shall observe local applicable noise ordinances and endeavor at all times to maintain as low a level of construction noise as practicable in order not to create a disturbance in the neighborhood. Particular care shall be exercised to reduce noise when the building is in normal use.
1. All workers on the project are required to conduct themselves in a professional manner. Abusive or obscene language will not be tolerated. No obscene gestures, whistles, or 'cat-calls' will be allowed. No soliciting or harassing students, faculty, staff or visitors for any reason. All personnel associated with the Work, are expressly prohibited from speaking with or touching any student at any time; the sole exception to this shall be in cases of dire emergency where it may be necessary to guide people to safety. The Owner reserves the right to have any worker barred from the school site.
 2. Smoking, use of alcohol or non-prescription drugs on school property is strictly prohibited.
 3. Workers on site shall wear proper attire and required safety gear at all times.

1.4 OWNER'S OCCUPANCY OR USE

- A. If the **Project** or any portion thereof is occupied or used by the Owner, such occupancy or use shall be predicated upon the following conditions.
1. The Contractor will not be required to pay maintenance costs on the portion of the **Project** occupied under this Agreement, nor shall he be responsible for wear and tear or damage resulting from such occupancy.
 2. In case of partial occupancy or use prior to the Substantial Completion date, the Owner shall secure endorsement from the Contractor's insurance carrier and consent of the Surety permitting such occupancy or use during the remaining period of construction.
 3. In the event of partial occupancy or use after the Substantial Completion date, the Contractor shall extend all necessary insurance coverage until Final Acceptance of the Project. Owner's use and occupancy prior to Final Acceptance shall not relieve the Contractor of his responsibility to maintain the insurance coverage required by the Contract Documents.
 4. In the event of any such partial occupancy or use, the periods of guarantees called for by the Contract Documents shall not commence until Substantial Completion of all work of the Contract.
 5. The Contractor shall make all arrangements with, and coordinate all construction schedules with the Owner at all times during the course of the work.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 31 13
PROJECT COORDINATION**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies supervisory and administrative requirements for coordination of Work, including, but not limited to:
 - 1. Coordination by contractor.
 - 2. Coordination Drawings.
 - 3. Existing utilities.
 - 4. Cutting and patching.
 - 5. Expedition of the Work to assure compliance with schedules.

1.2 COORDINATION BY THE CONTRACTOR

- A. The Contractor shall be responsible for the management, supervision and coordination of the work of the entire Contract and shall be responsible to identify areas where the installation of work will be restricted, congested or difficult for any reasons. Consult the various affected trades and prepare Coordination Drawings of these areas. Failure to identify "problem" areas or to prepare to work out the same shall be the responsibility of the Contractor, and all necessary re-working and/or relocation of the installed elements resulting from failure to provide sufficient spaces, clearances, etc., shall be provided without additional cost to the Owner.
- B. Coordination Drawings are for the Contractor and the various Subcontractors' use during construction and shall not be construed as replacing any Shop Drawings or Record Drawings required elsewhere in the Contract Documents.

1.3 COORDINATION DRAWINGS

- A. General: The Contractor shall prepare Coordination Drawings for areas where close and careful coordination of various affected trades is required. The Contractor shall be fully responsible for coordinating trades, coordinating construction sequence and schedules, and coordinating actual installed location and interface of work.
- B. Timing: Prior to fabricating materials or beginning work, the Contractor shall supervise and direct the production of one complete set of Coordination Drawings showing complete coordination and integration of work.
- C. Contractor shall carefully review field conditions and modify Coordination Drawings in cooperation with affected Subcontractors to assure conflicts are resolved before work in field is begun.

1.4 EXISTING UTILITIES

- A. Modifications or extensions of the existing utility service systems, where applicable, shall be done under the direct observation of the Owner's Representative. All tests in connection with this work shall be witnessed by authorized personnel of the Contractor and the Owner's Representative.
- D. When an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged the Contractor shall notify the Owner and the Utility company involved, and assure the protection, support, or moving of utilities to adjust them to the new work. The Contractor shall be responsible for all damage caused to existing active utilities under the work of this Contract, including resultant damages or injuries to persons or properties.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1.5 CUTTING AND PATCHING

- A. The Contractor shall coordinate and perform, or assign to the appropriate trade, all cutting, fitting, or patching as specified in Division 01 Section "[Cutting and Patching](#)".
- B. The Contractor shall provide all sheeting, shoring, bracing, underpinning, reinforcement and other temporary supports as may be required to maintain the integrity of, and prevent damage to, any structure or finish to be subjected to cutting work, and shall patch to restore to sufficient final strength, and acceptable appearance.

1.6 EXPEDITION OF THE WORK TO ASSURE COMPLIANCE WITH SCHEDULES

- A. Coordinate appropriate schedule recovery actions may include, but not be limited to any of the following: assignment of additional labor, Subcontractors, or construction equipment; Work during other than normal working hours subject to other requirements in the Contract Documents; expediting of submittals or deliveries; or any combination of any of them. Overlapping or re-sequencing of activities shall be appropriate only if properly substantiated in the schedule recovery plan.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 33 00
SUBMITTAL PROCEDURES**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for submittals required for performance of Work, including, but not limited to:
1. Construction Progress Schedules.
 2. Schedule of Values.
 3. Submittal schedule.
 4. Shop Drawings.
 5. Product Data.
 6. Samples.
- B. Administrative Submittals: Refer to requirements specified in other Division 01 Specification Sections, and other Contract Documents, for administrative submittals, including, but not limited to:
1. Permits.
 2. Applications for payment.
 3. Payment bonds.
 4. Insurance certificates.
 5. List of subcontractors.

1.2 SUBMITTAL PROCEDURES

- A. **The Architect will review Product Data, Shop Drawings, Samples, and similar submittals two times: once upon original submission and a second time if a revisions or corrections are requested by the Architect. Submittals not initially approved by the Architect shall be corrected by the Contractor prior to the second submittal.**
1. **The Contractor shall pay the Architect at \$125/hour for reviewing Product Data, Shop Drawings, Samples, or similar submittals which have to be revised and resubmitted after the second review by the Architect.**
 2. **The Contractor shall also pay the Architect at \$125/hour for evaluating deviations and substitutions proposed by the Contractor, for making revisions to the Contract Documents on account thereof, responding to requests for information and providing other services on account of such proposed deviations or substitutions, all regardless of whether such proposed deviations or substitutions are approved or rejected.**
- B. Coordination of Submittals: Coordinate preparation and processing of submittals with related construction activities. Transmit submittals sufficiently in advance of performance of Work, including related construction activities, to avoid delays. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related pertinent activities that require sequential activity.
1. The Architect may reject, or withhold action on submittals requiring coordination with other submittals until related submittals are received.
- C. Processing of Submittals: Allow sufficient review time to ensure installation will not be delayed because of time required to process submittals. Minimum processing times are as follows:

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1. Review by the Architect's Office Only: Allow at least ten (10) business days for review and processing.
 2. Review by the Architect and the Consultant: Allow at least ten (10) business days for review and processing of submittals by Architect, and at least an additional five (5) business days for review by each consultant.
 3. Reprocessing of Submittals: For submittals not approved initially, allow at least ten (10) business days for review and reprocessing of submittals by Architect, and at least an additional five (5) business days for review by each consultant.
 4. No extension of Contract Time will be authorized due to failure to transmit submittals sufficiently in advance of scheduled performance of Work.
- D. Contractor's Preparation of Submittals: Review and submit each submittal with a transmittal form. Place permanent label or title block on each submittal for identification. Indicate Project Name, Project Number, Specification Section number and title, date of submittal, name and address of Architect, name and Address of the Contractor, name and address of the Subcontractor and/or supplier, name and address of manufacturer, Drawing number and detail reference.
1. Contractor's Review and Action Stamp: Provide suitable space on label or title block for Contractor's review and action stamp. Stamp and sign each submittal to show the Contractor's review and approval prior to transmittal to the Architect. Submittals not signed and stamped by Contractor will be returned without action.
 2. The Architect's Review and Action Stamp: Provide minimum 4 in. x 4 in. space on label or title block for the Architect's review and action stamp. Deliver submittals to the Architect at address listed on cover of Project Manual.
 3. Modify and customize submittals as required to show interface with adjacent work and attachment to building.
- E. Transmittal of Submittals: Transmit each item with a transmittal form. Identify Project, Contractor, subcontractor, major supplier; identify pertinent Drawing sheet and detail number, and Specification section number, as appropriate, on transmittal form.
1. Source: Submittals received from sources other than the Contractor will be returned without action.
 2. Deviations from Contract Documents: When products, materials, or systems submitted deviate from Contract Documents, record deviations clearly on transmittal form with separate attached sheet as necessary.
- F. Comply with progress schedule for submittals related to Work progress.
- G. After Architect reviews submittal, revise and resubmit as required. Identify changes made since previous submittal. Changes not marked will be treated as having not been made, even if change is consistent with Contract Documents.
- H. Distribute copies of reviewed submittals to concerned persons. Instruct recipients to promptly report inability to comply with provisions.

1.3 CONSTRUCTION PROGRESS SCHEDULE

- A. Timing: Present Construction Progress Schedule at the Pre-Construction Meeting for Owner and Architect's review. Update the schedule monthly with Payment Applications.
- B. Preparation of Construction Progress Schedule: Prepare individual fully developed, construction schedule identify milestones on a critical path.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- C. Distribution: Print and distribute Construction Progress Schedule to the Architect, the Owner, Subcontractors, and other parties affected. Post copies in field. Instruct recipients to report promptly to the Contractor in writing problems apparent from projections shown on schedule.
- D. Revisions: Update and reissue Construction Progress Schedule, along with baseline comparison, monthly in conjunction with Application for Payment. Submit remedial action plans to the Architect each month to eliminate conditions that may cause delay to the Project.

1.4 SHOP DRAWINGS

- A. Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this Project on reproducible sheets. Show adjacent conditions and related work. Show accurate field dimensions where appropriate. Identify materials and products shown. Note special coordination required. Standard information prepared without specific reference to Project is not considered shop drawings.
- B. Shop drawings include fabrication and installation drawings, including but not limited to plans, elevations, sections, details, setting diagrams, schedules, patterns, templates, and similar drawings.
- C. Show every component of fabricated item, notes regarding manufacturing process, coatings and finishes, identifying numbers conforming to Contract Documents (i.e. stair numbers, door numbers, etc.), dimensions, and appropriate trade names. Show anchorage and fastening details, including type, size and spacing. Show material gage and thickness. Indicate welding details and joint types.
- D. Shop Drawing Sheet Size: Except for templates, patterns, and other full-size drawings, submit shop drawings on sheets at least 8-1/2 in. x 11 in., but no larger than 30 in. x 42 in.
- E. Submittal Quantities: Submit shop drawings in following quantities:
 - 1. Architectural: For shop drawings submitted for Architect's review, submit one reproducible and two black line print of each sheet.
 - 2. Consultants: For shop drawings that require Consultant's review, submit one reproducible and three black line prints of each sheet.

1.5 PRODUCT DATA

- A. Definition: Product data includes manufacturers standard published literature, such as installation instructions, catalog cuts, color charts, rough-in diagrams, wiring diagrams and Material Safety Data Sheet. When product data must be prepared specifically because standard published data is not suitable for use, submit as shop drawing.
- B. Preparation: Mark each copy of product data to show applicable choices and options. Where published product data includes information on several products and choices, mark copies to clearly indicate information applicable to this Project.
- C. Do not submit product data until compliance with requirements of Contract Documents has been confirmed.
- D. Submittal Quantities: Submit product data in following quantities:
 - 1. Architectural Work: Submit number of copies required by the Contractor, plus additional two (2) copies to be retained by the Architect.
 - 2. Consultant's Work: Submit number of copies required by the Contractor, plus an additional one (1) copy to be retained by the Consultant, and an additional three (3) copies to the Architect. Forward copy of transmittal to the Consultant. The

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

Consultant's review and comments will be made on copies returned to Architect, who will forward them to Contractor.

- E. Installer Copy: Verify that installer of Work possesses a current copy of Architect-approved product data prior to installation.

1.6 SAMPLES

- A. Submit samples identical with materials and products to be installed. Where indicated, prepare samples to match Architect's sample. Label sample with description, source, manufacturer's name, and catalog number. Submit samples along with certifications that products comply with referenced standards.
- B. Architect Review: Architect will review samples for confirmation of visual intent, color, pattern, texture, and type. Architect will not test samples for compliance with other specified requirements, which shall remain exclusive responsibility of the Contractor.
- C. Submittal Quantities: When variation in color, pattern, or texture can be expected in finish work, submit multiple samples (minimum of three) to show approximate limits of variations. Submit samples in following quantities:
 - 1. Initial Selection: For initial selection of color, texture, and pattern, submit one full set of manufacturer's available samples.
 - 2. Verification Samples: Submit three sets of samples selected. One set will be returned to Contractor for use at Project Site for quality control comparisons.
- D. Distribution: Distribute additional sets of approved samples to subcontractors, suppliers, installers, and others required for proper performance of Work. Indicate distribution on transmittal forms.

1.7 SCHEDULE OF VALUES

- A. Timing: Present Schedule of Values allocated to the various portions of the Work at the Pre-Construction Meeting for Owner and Architect's review and prior to the submission of the first Payment Application.
- B. When requested by the Architect, submit substantiating data supporting the values submitted.
- C. Intent: Unless objections are stated by the Architect, the Schedule of Values will be used as the basis for the Contractor's Applications for Payment.
- D. Form and Content of Schedule of Values: Type schedule on 8-1/2 in. x 11 in. white paper. Contractor's standard forms and automated printout will be considered for approval by the Architect upon Contractor's request. Identify schedule with title of Project and location, project number, name and address of the Architect, name and address of the Contractor, Contract designation, and date of submission.
 - 1. Line Item Categories: Follow the Table of Contents of Project Manual for major category items. Further sub-divide the major categories into smaller portions of the work as approved by Owner and Architect.
 - 2. List installed value of component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
- E. Sub-Values: For each major line item, list sub-values of major products or operations under the item.
- F. Overhead and Profit: For the various portions of the Work, include a directly proportional amount of the Contractor's overhead and profit.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- G. Stored Material: For items on which progress payments will be requested for stored materials, break down the value into the following sub-values:
 - 1. The cost of material, delivered and unloaded at Project Site, with taxes paid.
 - 2. Installation cost including overhead and profit.
- H. The sum of all values listed in the schedule shall equal the total Contract Sum.'

1.8 ARCHITECTS ACTION

- A. General: Architect will review submittals, stamp and indicate action, and return to Contractor. Architect will review submittals for conformance with design intent only. Architect's review and approval of submittals shall be held to limitations stated in the Conditions of the Contract. In no case shall approval or acceptance by Architect be interpreted as release of Contractor of responsibility to fulfill requirements of Contract Documents. No acceptance or approval of submittals, nor any indication or note marked by Architect on submittals, shall constitute authorization for increase in Contract Sum.
 - 1. [When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Owner and the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications, and neither the Owner nor the Architect shall be expected to make an independent examination with respect to the performance of such materials, systems or equipment.](#)
- B. Action Stamp: Architect will stamp each submittal with an action stamp. Stamp sample is indicated below:

()	Approved	()	Approved As Noted
()	Revise and Resubmit	()	Not Approved

Architects review is only for general conformance with design concept and compliance with requirements of Contract Documents. Review is based on Contractor's representation that he has checked and approved this submittal and has verified dimensions, quantities, field dimensions, relation to existing work, coordination with work to be installed later, and coordination with information in previously approved submittals. Accuracy of all such information is responsibility of the Contractor. Approval does not authorize, or relieve the Contractor of responsibility for deviations from drawings, specifications, supplementary documents furnished by the Architect, or previously approved submittals unless the Contractor has, in writing, called the Architect's attention to such deviations at the time of submittal. The Contractor is solely responsible for the accuracy of all information in the submittal and for details of fabrication and installation. Refer to Contract Documents for further submittal requirements and limitations on scope of the Architect's review.

DRUMMEY ROSANE ANDERSON, INC.

Date: _____ By: _____

- C. Stamp indicates action taken as follows:
 - 1. "APPROVED": No corrections, no marks: Resubmission not required.
 - 2. "APPROVED AS NOTED": Minor amount of corrections; all items may be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

3. "REVISE AND RESUBMIT": Minor corrections required; items noted shall not be fabricated until further corrections of original submittal is completed and Architect approval is obtained; checking is complete; clarify details of items noted by checker for approval; items without marks may be fabricated without further submittal. Resubmission required.
 4. *NOT APPROVED": Submittal does not conform to Contract Documents, and requires too many corrections, or is rejected for other justifiable reasons. Architect will state reasons for rejection. Correct and resubmit. Do not fabricate.
- D. Other Action: Submittal for information or record purposes will be returned with no action marked.
- E. Required Resubmittals: Make corrections or changes to submittals required by Architect and resubmit until approved. Revise initial shop drawings or product data, and resubmit as specified for initial submittal. Indicate changes made other than those requested by Architect. Submit new samples as required for initial submittal.
- 1.9 DISTRIBUTION BY CONTRACTOR
- A. Distribution: When submittal is marked "APPROVED", or "APPROVED AS NOTED", make prints and copies and distribute to the Subcontractors, suppliers, fabricators, and other parties requiring information from submittal for proper coordination and performance of the Work. Print copies of shop drawings from approved reproducible only.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 41 00
REGULATORY REQUIREMENTS**

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DEFINITIONS

- A. Regulations include laws, ordinances, statutes and lawful orders issued by authorities having jurisdiction, and rules, conventions and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.

1.4 REGULATIONS

- A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable regulatory requirements have the same force and effect as if bound or copied directly into the Contract Documents. Such regulatory requirements are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with the regulatory requirements in effect as of the date of the Contract Documents unless a specific date is indicated in the Contract Documents or the governing regulations cited herein.
- C. Conflicting Requirements: Where compliance with **two** or more requirements is specified and the regulatory requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent and highest quality requirement. Request a decision from the Architect before proceeding on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Request a clarification from the Architect regarding uncertainties before proceeding.
- D. Copies of Regulations: Each entity engaged in construction on the Project is required to be familiar with regulatory requirements applicable to its construction activity. Copies of applicable regulations are not bound with the Contract Documents.
 - 1. Where copies of regulations are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

1.5 GOVERNING REGULATIONS AND AUTHORITIES

- A. Obtain copies of the latest applicable State Codes and Regulations including but not limited to the following regulations and retain at the Project Site to be available for reference by parties who have a reasonable need during submittals, planning, and progress of the Work, until Substantial Completion.
 - 1. **780 CMR - Massachusetts State Building Code, 9th Edition.**

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2. International Building Code / 2015.
3. International Existing Building Code / 2015.
4. 248 CMR 10.00 - Massachusetts Uniform State Plumbing Code.
5. 527 CMR 12.00 - Massachusetts Electrical Code / National Electric Code / NFPA 70-2017.
6. 527 CMR 1.00 - Massachusetts Comprehensive Fire Safety Code / NFPA 1-2012.
7. International Mechanical Code / 2015.
8. International Plumbing Code / 2015.
9. International Energy Conservation Code / 2015.
10. NFPA 101.
11. 521 CMR - Massachusetts Architectural Access Board Regulations.
12. United States Department of Justice, N° 28 CFR Part 36 - Americans With Disabilities Act, (Public Law 101-336).
13. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities / 2009.
14. OSHA 29 CFR Part 1910 Occupational Safety and Health Regulations/1999.
15. OSHA 29 CFR Part 1926 Occupational Safety and Health Regulations for Construction/1999.
16. Local zoning bylaws.
17. Local wetland regulations, including but not limited to applicable Order of Conditions.
18. All other applicable local, state and federal laws, codes, regulations, and ordinances.

B. Trade Union Jurisdictions: Maintain current information on jurisdictional matters, regulations, actions and pending actions; and administer/supervise performance of Work in a manner which will minimize possibility of disputes, conflicts, delays, claims or losses.

C. Wage and hour rates: refer to Division 00 Section "Massachusetts Prevailing Wage Laws".

D. For Massachusetts State Building Code and how it can be obtained see <http://www.mass.gov/eopss/consumer-prot-and-bus-lic/license-type/csl/building-codebbrs.html> (The Official Website of the Executive Office of Public Safety and Security).

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents.

PART 2 - PRODUCTS

[Not Used]

PART 3 - EXECUTION

[Not Used]

END OF SECTION

SECTION 01 50 00
TEMPORARY CONSTRUCTION FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies temporary construction facilities and controls, including, but not limited to:
 - 1 Temporary utilities.
 - 2 Temporary construction and support facilities.
 - 3 Protection facilities.
 - 4. Any other means, methods, equipment and aids Contractor may deem necessary for the execution of the Work.
 - 5. Maintaining all services to Owner-occupied areas at all times.

1.2 REFERENCES

- A. Comply with requirements of authorities having jurisdiction, codes, OSHA, and industry standards including, but not limiting to the following. Where these standard conflict with other specified requirements, the most restrictive requirements shall govern.
 - 1 American National Standards Institute (ANSI):
A10 Safety Requirements for Construction and Demolition.
 - 2 National Electrical Contractors Association (NECA):
NJG-6 Temporary Job Utilities and Services
 - 3 National Fire Protection Association (NFPA):
70 National Electrical Code
241 Building Construction and Demolition Operations
 - 4. NEMA and UL standards

1.3 PROJECT CONDITIONS

- A. Conditions of Use: Maintain temporary facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload temporary facilities. Do not allow hazardous, dangerous, or unsanitary conditions to develop on site.
- B. Maintain the continuity of all temporary or permanent utility services at all times unless otherwise directed by the Owner.

1.4 QUALITY ASSURANCE

- A. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits
- B. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines; ICC/ANSI A117.1; and **521 CMR - Massachusetts Architectural Access Board Regulations.**
- C. Maintaining required means of egress for all Owner-occupied areas in accordance with **780 CMR - Massachusetts State Building Code.**
- D. Dust- and HVAC-Control Measure: Submit plans and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

frame for their installation. Identify further options if proposed measures are later determined to be inadequate. Include the following:

1. Locations of dust-control partitions.
2. HVAC system isolation methods.
3. Waste handling procedures.
4. Other dust-control measures.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Temporary materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.
- B. Polyethylene Sheet: Reinforced, fire-resistive sheet, **10-mil (0.25-mm)** minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- C. Dust-Control Adhesive-Surface Walk-off Mats: min. 20" x 30" size Dirt Catcher Super Sticky Mat by 3M.

2.2 PROTECTION OF THE EXISTING CONSTRUCTION, FURNISHINGS AND FINISHES

- A. Where necessary, fully cover and protect the existing construction, furnishings and finishes with heavy duty cotton drop clothes or plastic sheeting to prevent any damages or soiling resulted from performing the Work of this Contract.
 1. **Contractor shall cover the entire floor surfaces of the access routes used for construction but outside of the designated construction areas with heavyweight non-staining 46 mil Ram Board, taping the edges to maintain position. Reapply papers as required to maintain proper floor protection.**
 2. **Where staging, hoisting, and/or heavy construction equipment are used, overlay Ram Board with 1/2" thick plywood or 440 Homasote to protect existing flooring from any soiling or damage caused by the work of this Contract.**
 3. **At every interior temporary exit from the construction areas, provide a zippered plastic sheeting door and a Dust-Control Adhesive-Surface Walk-off Mat. Replace mat when no longer effective.**
- B. Clean, repair, and restore damages and soiling caused by the work of this Contract at no cost to the Owner. Immediately remove and replace the damaged existing construction, furnishings and finishes beyond repair at the Contractor's expenses.

2.3 TEMPORARY FIRE PROTECTION

- A. Contractor shall take all necessary precautions for the prevention of fire during construction. Keep work area orderly and clean and remove combustible rubbish promptly off site. Combustible materials shall be stored on site in a manner and at locations acceptable to local Fire Officials. Contractor shall comply with all suggestions regarding fire protection made by the insurance company with which the Owner maintains his fire insurance.
- B. Contractor shall provide and maintain in good working order, under all conditions, readily available to all portions of the work area, suitable and adequate fire protection equipment and services. Such facilities shall include, but not be limited to, two (2) UL labeled, 2-1/2 gal. Type ABC fire extinguishers.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2.4 TEMPORARY STAGING AND SCAFFOLDING

- A. Contractor shall furnish, erect, and maintain in safe condition all staging and scaffolding required to properly carry out and complete the work. Staging and scaffolding thus provided shall comply in all respects to the governing laws and codes.

2.5 TEMPORARY HOISTING EQUIPMENT AND MACHINERY

- A. Contractor shall furnish, install, operate, and maintain in safe condition all hoisting equipment and machinery required to properly carry out and complete the work. All hoisting equipment and machinery, and operation shall comply in all respects to the governing laws and codes.

2.6 TEMPORARY UTILITIES

- A. Contractor **will be allowed to make connection and/or utilize Owner's existing HVAC, water and electricity where required for the performance of the work.** Contractor shall be responsible for furnishing, installing, and maintaining temporary facilities required for use and further specified as follows:
1. **Owner will** pay for HVAC, water and electrical energy used on the Project from the beginning of construction operations to the Date of Substantial Completion of the Work.
 2. The furnishing of utilities by the Owner for the convenience of the Contractor and without charge shall be conditional upon the Contractor being conservative and prudent in their use. In the event Contractor are repeatedly wasteful in the use of the utilities thus provided, the Owner reserves the right to charge Contractor at an equitable rate for the energy consumed.

2.7 TEMPORARY LIGHTING

- A. The Contractor shall be responsible to arrange for adequate indoor lighting to illuminate staging, dangerous projections, and the like as required to protect the safety of workmen and other personnel.
- B. The Contractor shall furnish all extension cords, task lights, and accessories required to adequately illuminate the work surfaces for proper execution of the work.

2.8 TEMPORARY TRASH REMOVAL

- A. Contractor shall be responsible for trash removal for all trades, and shall have the trash and construction debris hauled away, and legally disposed of off the site on daily basis. At his discretion, Contractor may provide dumpster type trash container for his own use and for the use by all subcontractors. The dumpster thus provided must be placed at a location approved by the Owner and shall be emptied at sufficient intervals to maintain the capacity and continuously ready to receive trash and debris. **Use of the Owner's dumpster shall be strictly prohibited.**
- B. Construction waste disposal must comply with the 310 CMR 19.017: Massachusetts Waste Disposal Ban Regulation.

2.9 NOISE, DUST, AND POLLUTION CONTROL

- A. All work performed under the Contract shall conform to the requirements of Massachusetts General Laws Chapter III, Sections 31C and 142D, and Rules and Regulations adopted thereto by the Massachusetts Department of Public Health, and the requirements of local noise, dust, and pollution control ordinances, and regulative agencies applicable to the work.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2.10 TEMPORARY STORAGE FACILITIES

- A. Space for storage shall be confined to within the work areas unless at other specific locations as directed and approved by the Owner in writing.
- B. Storage of material within the existing building will be permitted only provided such storage, and the handling required thereby, does not damage or overload the building structure or finishes, does not interfere with the safe and expeditious performance of the work, does not interfere with Owner's operations or block the required exit ways, and does not present or cause a fire or other hazard.

PART 3 - EXECUTION

3.1 TEMPORARY WEATHER PROTECTION

- A. **Where building envelop elements of the building providing weather protection are to be temporarily opened to the weather, they shall be fully enclosed or covered with securely attached and well draining enclosures against inclement weather, to assure absolute weather protection. Any and all damages to the existing construction, including all materials, equipment, furnishings, and finishes thereon, caused by inadequate weather protection shall be immediately made good by the Contractor without further cost to the Owner.**

3.2 TEMPORARY SANITARY FACILITY

- A. **Use of any existing school sanitary facility is strictly prohibited.** Contractor shall provide sufficient sanitary facility for his own use in accordance with Division 01 Section "[Temporary Sanitary Facilities](#)".

3.3 MAINTENANCE, TERMINATION, AND REMOVAL

- A. Enforce strict discipline in use of temporary facilities. Limit waste and abuse.
- B. Maintain temporary facilities in operating condition; repair damages immediately upon discovery. Unless otherwise requested by Owner, remove each temporary facilities when no longer useful. Clean and renovate existing work affected by the work of this contract.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 60 00
PRODUCT REQUIREMENTS**

PART 1 - GENERAL

1.1 PRODUCTS INCORPORATED INTO THE WORK

- A. Conform to applicable specifications and standards.
- B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.
- C. Manufactured and Fabricated Products:
 - 1. Design, fabricate and assemble in accord with the best engineering and shop practices.
 - 2. Manufacture like parts of duplicate units to standard size and gages, to be interchangeable.
 - 3. Two or more items of the same kind shall be identical, by the same manufacturer.
 - 4. Products shall be suitable for service conditions.
 - 5. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
- D. Do not use material or equipment for any purpose other than that for which it is designed or is specified.
- E. No asbestos containing products or lead containing products shall be permitted on this Project.
- F. All finishes and materials used in this Project shall be low V.O.C.

1.2 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.3 MANUFACTURERS' INSTRUCTIONS

- A. When work is specified to comply with manufacturers' instructions, submit copies of said instructions, as specified in Division 01 Section "[Submittal Procedures](#)", distribute copies to persons involved, and maintain one set in field office.
- B. Perform work in accordance with details of instructions and specified requirements. Should a conflict exist between Specifications and manufacturer's instructions, consult with Architect.

1.4 TRANSPORTATION AND HANDLING

- A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- B. Transport Products by methods to avoid Product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling or damage.
- D. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and products are undamaged.

1.5 STORAGE AND PROTECTION

- A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.
- B. After installation, provide coverings to protect Products from damage from traffic and construction operations, remove when no longer needed.

1.6 PRODUCT OPTIONS

- A. Product options:
 - 1. Products specified only by reference standard: Any Product meeting that standard.
 - 2. Products specified by naming three or more manufacturers: Products of any named manufacturer meeting Specifications.
 - 3. Products specified by naming one manufacturer and "or equal": Submit a request for substitution for any manufacturer not specifically named.

1.7 PRODUCT SUBSTITUTIONS

- A. Substitutions of products shall comply with requirements of Chapter 30, Section 39M of General Laws, and additional requirements and procedures specified herein.
- B. Where products or materials are specified by manufacturer's name, trade name or catalog reference, an item shall be considered equal to the item so named or described if in the opinion of the Architect that:
 - 1. It is at least equal in quality, durability, appearance, strength and design; including compliance with applicable specifications and compatibility with physical space allocations provided for the item;
 - 2. It performs at least equally the function imposed by the general design for the work;
 - 3. It conforms substantially, even with deviations to the detailed requirements for the item as indicated by the Contract Documents.
- C. Should the Contractor, after the award of the Contract, wish to use any products or materials other than those specified, he shall request written permission of the Architect using Substitution Request Form attached at the end of this Section. His request shall name and adequately describe (including shop drawings) the proposed substitutions, furnish any information requested by the Architect, and state what difference, if any, will be made in the Contract price, including the cost of changes in the Work, for such substitutions should they be accepted. Upon receipt of complete information from the Contractor, the Architect will consider all aspects of the proposed substitution and advise the Contractor in writing approving or disapproving the substitution. The principal reasons for approval or disapproval of the substitution will be enumerated by the Architect. Disapproval of the substitution shall not be cause for an increase in Contract price or a delay in schedule.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- D. Request constitutes a representation that Contractor:
1. Has investigated proposed Product and determined that it meets or exceeds, in all respects, specified Product.
 2. Will provide the same warranty for substitution as for specified Product.
 3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects at no additional cost to the Owner.
 4. Waives claims for additional costs which may subsequently become apparent.
- 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 substantial revision of Contract Documents.
- F. Architect will determine acceptability of proposed substitution, and will notify Contractor of acceptance or rejection in writing within a reasonable time.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 73 00
EXECUTION REQUIREMENTS**

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 1. Examination.
 2. Preparation.
 3. Installation of the Work.
 4. Progress cleaning.
 5. Protection of installed construction.

1.3 RELATED WORK

- A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
 1. Division 01 Section "[Summary of Work](#)": for limits on use of Project site.
 2. Division 01 Section "[Submittal Procedures](#)": for submitting surveys.
 3. Division 01 Section "[Cutting and Patching](#)": for execution requirements of executing cutting and patching.
 4. Division 01 Section "[Contract Closeout](#)": for requirements of executing final cleaning.

1.4 INFORMATIONAL SUBMITTALS

- A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

[Not Used.]

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, and water-service piping; underground plumbing and electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, roofs, and other substrates for suitable conditions where products and systems are to be applied or installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Re-check measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "[Project Coordination](#)".

3.3 INSTALLATION OF THE WORK

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing prod-

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

ucts in applications indicated.

- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

- D. **Installed Work:** Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

- E. **Concealed Spaces:** Remove debris from concealed spaces before enclosing the space.

- F. **Exposed Surfaces in Finished Areas:** Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. **Waste Disposal:** Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

- H. **During handling and installation,** clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration until Substantial Completion.

- I. **Clean and provide maintenance on completed construction** as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

- J. **Limiting Exposures:** Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Comply with manufacturer's written instructions for temperature and relative humidity.

- B. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration until date of Substantial Completion.
 1. Repair, restore, or replace if not repairable, any and all damaged work at no cost to the Owner.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 73 29
CUTTING AND PATCHING**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements for cutting, fitting, and patching required to complete the Work or to:
 - 1. Make several parts fit together properly.
 - 2. Uncover portions of the Work to provide for installations of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of Contract Documents.
 - 5. Provide routine penetrations of non-structural elements.
- B. Unless otherwise specifically specified in other Sections, the Contractor shall coordinate and perform, or assign to the appropriate trades, all cutting, fitting, and patching.

1.2 QUALITY ASSURANCE

- A. Permission to patch any items of work does not imply a waiver of the Owner's right to require complete removal and replacement in said areas or said items if, in the Architect's opinion, patching does not satisfactorily restore quality and appearance of work.
- B. Do not cut-and-patch structural work in anyway resulting in a reduction of load-carrying capacity or load/deflection ratio.
- C. Do not cut-and-patch operational elements and safety- related components in any way resulting in a reduction of capacities to perform in the manner intended or resulting in decreased operational life, increased maintenance, or decreased safety.
- D. Do not cut-and-patch work that is exposed to view in a manner resulting in reduction of visual qualities or in substantial evidence of cut-and-patch work, both as judged solely by the Architect. Remove and replace visually unsatisfactory work as directed by Architect.

1.3 SUBMITTALS

- A. Submit a written request to the Architect well in advance of executing any cutting or alteration that affects:
 - 1. Work of the Owner or separate contractor.
 - 2. Structural value or integrity of any element of the Project.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance, or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Except as otherwise indicated or authorized by the Architect, provide materials for cutting-and-patching which will result in equal-or-better work than the work being cut-and-patched, in terms of performance characteristics and including visual effect where applicable. Comply with the requirements of the material manufacturer, and use

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

materials identical with the original materials where feasible and where recognized that satisfactory results can be produced thereby.

- B. Comply with specifications and standards for each specific product involved.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Inspect conditions of Project, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering work, inspect conditions affecting installation of Products, or performance of work.
- C. Report unsatisfactory or questionable conditions to the Architect in writing; do not proceed with work until the Architect has provided further instructions.

3.2 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of Work.
- B. Provide devices and methods to protect other portions of the Project from damage.
- C. Provide protection from elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water.

3.3 PERFORMANCE

- A. Execute cutting and patching by methods that will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.
 - 1. In general, where mechanical cutting is required, cut work with sawing and grinding tools, not with hammering and chopping tools. Core drill openings through concrete work.
 - 2. Prior to cutting any structural steel or concrete work, contact the Architect in writing. Do not cut any structural steel and concrete work until approval has been granted by the Architect.
- B. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- C. Restore work which has been cut or removed; install new products to provide completed Work in accordance with requirements of Contract Documents.
- D. Patch with seams that are durable and as invisible as possible. Comply with specified tolerances for the work.
- E. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 01 77 00
CONTRACT CLOSE-OUT**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements during contract close-out. Including, but not limited to:
1. Substantial Completion.
 2. Final Acceptance.
 3. Record document submittal.
 4. Maintenance data.
 5. Warranties.
 6. Final cleaning.

1.2 SUBSTANTIAL COMPLETION

- A. Prior to requesting inspection for certification of Substantial Completion, complete the following:
1. On Application for Payment, show 100% completion for portions of work claimed as substantially complete. Submit list of incomplete items, value of incomplete work, reasons work is not complete, and scheduled or projected time of completion.
 2. Submission of warranties.
 3. Submission of maintenance data and instructions.
 4. Submission of final Project Record Documents.
 5. Final cleaning.
 6. Application for reduction of retainage.
 7. Consent of surety.
 8. Notification of shifting insurance coverage.
- B. Within reasonable time, Architect will inspect to determine status of completion.
- C. Should the Architect determine Work is not substantially complete, he will promptly notify Contractor in writing, giving reasons therefor. The Architect's notification will be detailed or general as he deems appropriate to the actual status of completion observed.
1. Reinspection Fees: Should Architect perform reinspection due to failure of Work to comply with claims made by the Contractor, the Contractor shall compensate Architect for such additional services at **\$125/hr**, and deduct the amount of such compensation from final payment to the Contractor.
- D. The Contractor shall substantially complete work, and remedy any noted deficiencies, and send a second written notice of substantial Completion. Architect will reinspect the Work.
- E. When Architect determines Work is Substantially Complete, he will prepare Certificate of Substantial Completion in accordance with the [Consolidated General Conditions](#). Specific time period shall be established by the Certificate of Substantial Completion for the Contractor to complete all work for Final Acceptance.

1.3 FINAL ACCEPTANCE

- A. Prior to requesting final inspection for certification of Final Acceptance and final payment, complete the following:

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1. Submission of final payment request with releases and supporting documentation.
 2. Completion of incomplete Work.
 3. Assurances that unsettled claims have been or will be settled.
 4. Submission of updated final settlement, including accounting for final additional changes to the Contract Sum. Show additional Contract Sum, additions and deduction, previous Change Orders, Total Adjusted Contract Sum, previous payments and Contract Sum due.
 5. Submission of consent of surety.
 6. Submission of evidence of final, continuing insurance coverage complying with insurance requirements.
 7. Prove that taxes, fees, and similar obligations have been paid.
 8. Remove temporary facilities and service.
 9. Remove surplus materials, rubbish and similar elements.
 10. Certify Work has been inspected for compliance with Contract Documents.
 11. Certify Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected.
 12. Certify Work is complete and ready for final inspection.
 13. Certify materials incorporated have no asbestos containing materials or lead.
 14. Acceptance of Work by the Owner.
- B. The Architect will inspect to verify status of completion with reasonable promptness.
1. Should the Architect consider Work is incomplete or defective, the Contractor will promptly notify Contractor in writing, listing incomplete or defective work.
 2. The Contractor shall take immediate steps to remedy deficiencies and send a second written certification that Work is complete, and Architect will reinspect the work.
 3. When the Architect finds Work is acceptable, he will consider closeout submittals.
 4. Reinspection Fees: Should Architect perform reinspection due to failure of Work to comply with claims made by the Contractor, The Contractor shall compensate Architect for such additional services at \$125/hr, and deduct the amount of such compensation from final payment to the Contractor.
- C. Application for Final Payment: Submit Application for Final Payment in accordance with procedures and requirements of the [Consolidated General Conditions](#).

1.4 RECORD DOCUMENTS

- A. General: Maintain a complete set of record Documents. Do not use Record Documents for construction purposes. Provide access to Record Documents for Architect's and Owner's reference. General, without limitation, Record Documents shall include the following:
1. Record Drawings: Maintain a clean set of mylars of Contract Drawings and shop drawings, updated to show actual installation. Give particular attention to concealed items.
 2. Record Project Manual: Maintain a clean Project manual, including Addenda, Change Orders, Architect Field Orders, and other modifications, updated to show changes in actual work performed. Give particular attention to substitutions, selection of options, and similar information.
 3. Record Product Data: Maintain one copy of each approved Product Data submittal, updated to show changes from products delivered, work performed, and from manufacturer's recommended installation instructions.
 4. Record Samples: Maintain one copy of each approved Sample submitted.
- B. Maintenance of Documents and Samples: Store documents and samples in Contractor's office apart from documents used for construction. File documents and samples in accordance with CSI format. Maintain documents in clean, dry, legible conditions and in good order.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- C. Recording: Label each document "PROJECT RECORD" in neat large printed letters. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
- D. Drawings: Legibly update all Drawings to record actual construction, including the following:
 - 1. Field changes of dimension and detail.
 - 2. Changes made by Change Order.
 - 3. Details not in original Contract Documents.
- E. Specifications and Addenda: Legibly mark each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Change Order.
- F. Submittal: At Contract Close-out, deliver Record Documents to Architect. Accompany submittal with transmittal letter in duplicate, indicating the date, project title and number, Contractor's name and address, title and number of Record Document, and signature of Contractor or his authorized representative.

1.5 MAINTENANCE DATA

- A. Prepare and submit Maintenance Data as specified in this Section and referenced in other pertinent Sections of Specifications. Organize Maintenance Data into suitable sets, bound and indexed. Mark appropriate identification on front and spine of each binder. Including the following types of information;
 - 1. Emergency instructions.
 - 2. Copies of warranties.
 - 3. Inspection procedures.
- B. Provide sufficient instruction to Owner's personnel in maintenance of products.
- C. Format of Data: Prepare data in form of instruction manual for use by the Owner's personnel. Format shall be 8-1/2 in. x 11 in., in 20 pound, white, typed pages. Text shall be manufacturer's printed data or neatly typewritten. Drawings shall be bound with text, with reinforced punched binder tabs/ fold larger drawings to sizes of text pages. Provide fly-leaf for each separate product or each piece of operating equipment. Provide indexed tabs.
 - 1. Binders: Provide commercial quality three-ring binders with durable and cleanable plastic covers, with maximum ring size of 1 inch. When multiple binders are used, correlate the data into related consistent groupings.
 - 2. Binder Cover: Identify each volume with typed or printed title "Maintenance Instructions". List the title of Project, identity of separate structure as applicable, and identity of general subject matter covered in the manual.
- D. Content of Manual: Neatly typewritten table of contents for each volume, arranged in systematic order, indicating the Contractor's name and address, and a list of each product, indexed to content of the volume. Provide a separate list with each product, name, address, and telephone number of subcontractor or installer, and local source of supplies for parts and replacement.
 - 1. Provide in each volume a copy of each warranty, bond, and service contract issued.

1.6 INSTRUCTION OF OWNER'S PERSONNEL

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- A. Prior to final inspection or acceptance, provide adequate instructions to Owner's designated operating and maintenance personnel in the maintenance of all products.
- B. Maintenance manual shall constitute the basis of instruction.

1.7 WARRANTIES

- A. General: assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Information required: provide information on the proper procedures in case of failure. Indicate instances which might affect the validity of warranty. Indicate Contractor, name of responsible principal, address, and telephone number.
- C. Form of Submittal: Prepare duplicate packets of 8-1/2 X 11 in., punched sheets for installation in standard three-ring binder. Fold larger sheets to fit into binders.
 - 1. Cover of Packet: Identify each packet with typed or printed title 'WARRANTIES'. List the project title and number, and name of Contractor.
 - 2. Binders: Bind into commercial quality, three-ring, with durable and cleanable plastic covers.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Provide cleaning materials that will not create hazards to health nor property, and will not damage surfaces or finishes. Use only cleaning materials and methods recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Employ experienced workers or professional cleaners for Final Cleaning. Clean each surface to the condition expected in a normal building cleaning and maintenance program. Comply with manufacturer's instructions and recommendation.
- B. Clean and restore general work areas and adjoining surfaces soiled or damaged by the work of this Contract. Where performance of subsequent work could result in damage to completed work, provide protective covering to prevent potential damage.
- C. Complete the following cleaning operations prior to requesting inspection for Certification of Substantial Completion:
 - 1. All advertising matter and temporary instructional material shall be removed from exposed surfaces throughout. Remove labels that are not permanent.
 - 2. Clean work area of rubbish, litter and other foreign substances. Follow the product manufacturer's instructions; clean entire work area to a dust-free condition. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed surfaces.

END OF SECTION

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 23 00 00
HEATING, VENTILATION AND AIR CONDITIONING**

INDEX

PART 1 GENERAL	1
1.1 GENERAL.....	1
1.2 BID REQUIREMENTS.....	1
1.3 WORK INCLUDED.....	1
1.5 DEFINITIONS.....	2
1.6 VALVE TAGS, NAMEPLATES AND CHARTS.....	2
1.7 SHOP DRAWINGS.....	3
1.8 CODES, REGULATIONS AND PERMITS	3
1.9 INTENT.....	3
1.10 DRAWINGS AND SPECIFICATIONS.....	3
1.11 MATERIALS AND EQUIPMENT	4
1.12 REFERENCES.....	4
1.13 COORDINATION DRAWINGS.....	4
1.14 MOTORS AND STARTERS.....	5
1.15 TEMPORARY HEATING.....	5
1.16 OPERATIONS AND MAINTENANCE MANUALS.....	5
1.17 RECORD DRAWINGS.....	6
1.18 CONTRACT COST BREAKDOWN.....	6
1.19 GUARANTEE AND SERVICE.....	6
1.20 DEBRIS REMOVAL AND CLEAN-UP.....	6
1.21 EXAMINATION OF SITE AND DOCUMENTS.....	6
1.22 SCHEDULE OF VALUES.....	7
1.23 WARRANTY.....	7
PART 2 PRODUCTS	7
2.1 INSULATION MATERIALS (GENERAL REQUIREMENTS).....	7
2.2 INSULATION (SHEET METAL).....	8
2.3 MOTORS.....	9
2.4 PIPING MATERIALS.....	10
2.5 PACKAGED ROOFTOP UNIT	13
2.6 SHEET METAL WORK.....	19
2.7 SLEEVES, INSERTS AND OPENINGS	22
2.8 SUPPLEMENTAL SUPPORT SYSTEM.....	24
2.9 AUTOMATIC TEMPERATURE CONTROLS.....	25
2.10 HOISTING MACHINERY AND EQUIPMENT.....	35
PART 3 EXECUTION	35
3.1 MATERIALS AND WORKMANSHIP.....	35
3.2 COORDINATION.....	35
3.3 COORDINATION DRAWINGS.....	36
3.4 PROTECTION AND CLEAN UP.....	37
3.5 OPERATING AND MAINTENANCE MANUALS	37
3.6 OPERATING INSTRUCTIONS.....	37
3.7 SYSTEM START-UP AND OPERATION.....	38
3.8 SYSTEMS IDENTIFICATION.....	39
3.9 SHEET METAL WORK REQUIREMENTS.....	40
3.10 PIPING SYSTEM INSTALLATION.....	41
3.13 INSULATION APPLICATION REQUIREMENTS.....	42
3.14 SYSTEM BALANCING.....	44
END OF SECTION.....	47

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

**SECTION 23 00 00
HEATING, VENTILATING AND AIR CONDITIONING**

PART 1 GENERAL

1.1 GENERAL

- A. Division A and Division 1 of these specifications are hereby made a part of this section.
- B. Include all labor, materials, equipment, appliances and services necessary to furnish, fabricate and install all work specified herein. Refer to the drawings for further definition of location, extent and details of the work.
- C. Where the specifications refer to three (3) products, by name, catalog number and/or manufacturer, it is the intent of the specification that the Contractor shall submit one (1) to the Engineer for approval.
- D. Where the specifications refer to less than three (3) products by name, catalog number and/or manufacturer, unless otherwise specified, the intent is to establish a standard of quality and not be construed as limiting competition; in such cases, the Contractor may, with the permission of the Engineer, submit detailed information to the Engineer for his review. If, in the judgment of the Engineer, the submission is acceptable, the Engineer will transmit his approval in writing to the Contractor.

1.2 BID REQUIREMENTS

- A. The work of this section is required by law to be bid in accordance with the Massachusetts Bid statues.
- B. Submit the bid for the work specified here, on the Form for Bid, which will be furnished by the Awarding Authority. A sample of this bid form is bound into the Project Manual for reference.
- C. Submit bids in a sealed plain envelope marked in accordance with the Instructions to Bidders and at the time and place indicated in the Instructions to Bidders.
- D. Refer to Instructions to Bidders for additional information concerning this contract and bid requirements.
- E. The work of this contract is shown on the drawings ME-1 and ME-2.

1.3 WORK INCLUDED

- A. The intention of the specifications and plans is to provide for finished systems, properly tested, balanced and ready for operation, including necessary minor details and accessories required to make the work complete, even though such items may not be expressly shown or specified.
- B. The scope shall include, but not be limited to, the following:
 - 1. Packaged, gas fired, multi-zone rooftop unit.
 - 2. Ductwork.
 - 3. Insulation.
 - 4. Gas piping and gas train vent piping.
 - 5. All cutting and patching.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- 6. Staging and scaffolding.
- 7. Demolition.

C. The work covered by this section of the specification includes the furnishing of all labor and materials and in performing all operations in connection with the installation of the work shown on the drawings and as described herein and shall be interpreted as work to be done by this Contractor. Work to be performed by other trades will always be specifically referenced to a particular Contractor and/or Section.

1.4 RELATED WORK SPECIFIED ELSEWHERE

A. The following items of labor and material incidental to, or related to the installation of the HVAC work shall be provided by this Contractor acting in the capacity of the General Contractor.

- 1. DIVISION 1 - GENERAL REQUIREMENTS
SECTION 01 31 13 PROJECT COORDINATION
 - a. Coordination of cutting and patching.SECTION 01 73 29 - CUTTING AND PATCHING

1.5 DEFINITIONS

- A. "This Contractor" – shall mean specifically the HVAC Contractor providing work under this respective section of the specifications and it is the intent that the HVAC Contractor shall fulfill all the requirements of the General Contractor for this project.
- B. "Provide" – Shall mean the furnishing and installing of materials and/or equipment.
- C. "Finished grade" – As used herein, means the final grade elevations indicated on the drawings.
- D. "Concealed" – Shall mean in walls, in chases, above ceilings, within enclosed cabinets, underground, in trenches or otherwise enclosed.
- E. "Exposed" – Shall mean in closets, in finished rooms, under counters, behind and/or under equipment and/or otherwise visible.
- F. "HVAC" – Shall mean heating, ventilating and air conditioning.
- G. "Piping" – Shall mean pipe, fittings, hangers and valves.
- H. "General Contractor" – Shall mean Contractor or Contractors as designated by the Contract Documents as responsible to perform work as referred under this section, as well as other sections of the specifications.

1.6 VALVE TAGS, NAMEPLATES AND CHARTS

- A. Furnish and install on each gate and globe valve, and on all automatic control valves used in this contract, a two-inch diameter brass tag with stamped numeral a minimum height of one-half inch painted white. The tags shall be attached to the valve handles or stem necks with brass hooks or chains and properly secured.
- B. These numbers shall correspond to numbers indicated for valves on the Record Drawings and on two printed detailed lists. These printed lists shall state the numbers and locations of each valve and control and the section, fixture or equipment which it controls, and other necessary information such as requiring the opening or closing of another valve or valves,

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

when any one valve is to be opened or closed.

- C. These printed lists shall be prepared in form to meet approval of the Engineer and shall be framed under glass.
- D. Nameplates, catalog numbers and rating identification shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

1.7 SHOP DRAWINGS

- A. General: Refer to Division 1, General Requirements, Section 013300, Submittal Procedures, for submittal provisions and procedures.
- B. In accordance with Division 1, General Requirements, submit to the Engineer for approval complete sets of detailed information consisting of manufacturers' bulletins, capacities, shop drawings, and parts lists of all material to be provided for this project.
- C. Any manufacturer's names and/or model numbers identified herein are intended to assist in establishing a general level of quality, configuration, functionality, and appearance required. Unless noted otherwise, this is NOT a proprietary specification and it should be noted that "Or approved equal" applies to all products denoted herein. It is understood that all manufactures will have minor variations in configuration, appearance, and product specifications and such minor variations shall not eliminate such manufacturers as an "approved equal". It is the intent of this specification to encourage open and competitive involvement from multiple manufacturers that are able to supply similar products.

1.8 CODES, REGULATIONS AND PERMITS

- A. All work done under this SECTION shall conform to the codes and regulations governing such work as set forth by the Massachusetts Department of Public Safety, the Massachusetts State Building Code and all local codes having jurisdiction.
- B. Give notices, file plans, obtain permits and licenses, and obtain necessary approvals from authorities having jurisdiction. Deliver certificates of inspection to Engineer. No work shall be covered before examination and approval by Engineer, inspectors and authorities having jurisdiction. Imperfect or condemned work shall be replaced with work conforming to requirements, without extra cost to Owner, subject to the approval of the Engineer. If work is covered before due inspection and approval, the HVAC Subcontractor shall pay costs of uncovering the installed work, whether it meets contract requirements or not.
- C. Refer to Division 1, Section 014100, Regulatory Requirements.

1.9 INTENT

- A. It is not intended that the Drawings show every pipe, fitting, and appurtenance. All such parts necessary for the complete execution of the work, in accordance with the best practices of the trade and to the satisfaction of the Engineer shall be provided whether these parts may have been specifically mentioned or not, or indicated on the Drawings.

1.10 DRAWINGS AND SPECIFICATIONS

- A. The Drawings and Specifications are complementary each to the other, and any labor or material called for by either, whether or not by both, or necessary for the successful operation of any components shall be furnished and installed.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- B. Before installing any work, verify that it does not interfere with the clearances required for other work. Installed work which interferes with existing necessary services shall be modified as directed by the Engineer, at no additional cost to the Owner.
- C. Be familiar with the Drawings and Specifications of all other trades to prevent interferences and assure complete coordination.

1.11 MATERIALS AND EQUIPMENT

- A. All materials and equipment furnished under this SECTION shall be new and of the best grade for the service intended. The manufacturers mentioned in the specifications are intended to indicate the quality desired. Any substitutions shall be as approved by the Engineer as herein provided by the "or equal" clause, in addition to meeting the limitations of space and capacity shown or specified. Re-built materials and equipment will not be accepted.

1.12 REFERENCES

- A. National standards referenced herein are included to establish recognized quality only. Equivalent quality and testing standards will be acceptable subject to their timely submission, review and acceptance by the Designer.
- B. Refer to SECTION 01420 - REFERENCES for schedule of references.
- C. Reference Standards:
 - 1. Reference herein to any technical society, organizations, group or body are made in accordance with the following abbreviations:

ADC	Air Diffusion Council
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning & Refrigeration Institute
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing Materials
AWG	American Wire Gauge
AWS	American Welding Society
FS	Federal Specifications
IEEE	Institute of Electrical and Electronic Engineers
NEC	National Electrical Code
NEMA	National Electrical Manufacturer Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriters Laboratories, Inc.

1.13 COORDINATION DRAWINGS

- A. Before materials are purchased or work is begun, the HVAC contractor shall prepare and submit to the Designer, Coordination Drawings showing the size and location of his equipment, ductwork and piping lines relevant to the complete system. He shall ensure that these drawings are compatible and correctly annotated and cross- referenced at their interfaces.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- B. Coordination drawings are for the Contractor's and the Designer's use during construction and shall not be construed as replacing any shop or record drawings required elsewhere in these Contract Documents.

1.14 MOTORS AND STARTERS

- A. Motors for all equipment under this SECTION shall be quiet in operation and shall be guaranteed to run without objectionable noise or vibration.
- B. Motors smaller than one-half (1/2) horsepower shall be wound for 120 volts, single phase, 60 hertz.
- C. Motors one-half (1/2) horsepower and larger shall be wound for 208 volt, 3 phase, 60 hertz.
- D. Starters for all equipment shall be provided by the Electrical Subcontractor.
- E. Voltages shown in Paragraphs B and C are typical unless otherwise noted.
- F. All motors one horsepower and over shall be premium efficiency type.

1.15 TEMPORARY HEATING

- A. Special reference is made to "Heating during Construction", Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

1.16 OPERATIONS AND MAINTENANCE MANUALS

- A. At least two (2) months prior to occupancy or final acceptance of the project, turn over to the Engineer, three (3) complete bound manuals and one (1) digital electronic copy, containing the following in accordance with CLOSEOUT SUBMITTALS, SECTION 017700:
 - 1. Operating manuals and operating instructions for the various systems.
 - 2. Catalog data sheets for each item of mechanical or electrical equipment actually installed including performance curves, rating data and parts lists.
 - 3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated.
 - 4. Names, addresses and telephone numbers of repair and service companies for each of the major systems installed under this Contract.
 - 5. Copies of all service contracts provided for the guarantee period.
 - 6. Copies of all equipment and system warranties.
- B. Non-availability of operating and maintenance manuals or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the Owner until such time as the discrepancy has been corrected and/or retainage of sufficient monies to prepare same.
- C. Provide qualified trained personnel to insure proper operation of the systems and to train the Owner's operating and maintenance personnel in the proper operation and maintenance of the systems. Instruction period shall be a minimum of five (5) eight-hour days. The contractor shall video record the training sessions and include a copy of the training video in each copy of the Operations & Maintenance Manuals.
- D. Refer to SECTION 01 75 00, Starting and Adjusting. Coordinate all start-up, operation, and testing activities with the Project Manager and General Contractor.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1.17 RECORD DRAWINGS

- A. The General Contractor shall provide two (2) sets of black line on white record drawings to this Contractor, one set of which shall be maintained at the site and which shall, at all times, be accurate, clear and complete, showing the actual location of all equipment and piping. The record drawings shall be available to the Engineer's field representative at all times. Any addenda sketches and supplementary drawings issued during the course of construction shall be transferred to the record drawings.
- B. At the completion of the contract, the General Contractor shall submit an accurate checked set of as-built drawings. Non-availability of record drawings or inaccuracies therein will postpone the final inspection until they are available.
- C. After approval of these as built drawings, photo reproductions of the original tracings shall be revised to incorporate all the changes on the as-built drawings. These photo reproductions shall be certified as correct and delivered to the Engineer together with two (2) sets of black line prints and an electronic PDF version on CD.
- D. All valves shown on these drawings shall be numbered with numbers corresponding to those on the valve charts.
- E. All costs related to the foregoing requirements shall be paid for by this Contractor.

1.18 CONTRACT COST BREAKDOWN

- A. Within 30 days of commencing the work, submit to the Engineer a complete breakdown of the Contract price to aid in determining the value of the installed work during the construction period. The form shall correspond to the construction schedule with a percentage of progress to complete breakdown with progress description by month.

1.19 GUARANTEE AND SERVICE

- A. Attention is directed to the provisions of the CONTRACT AND GENERAL CONDITIONS regarding guarantees/warranties for the Work.
- A. Manufacturers shall provide their standard guarantees/warranties for work under this Section. However, such guarantees/warranties shall be in addition to and not in lieu of all other liabilities which the manufacturer and the Contractor may have by law or by other provisions of the Contract Documents.

1.20 DEBRIS REMOVAL AND CLEAN-UP

- A. The HVAC Subcontractor shall, at the end of each day's work, remove waste materials and debris resulting from the installation of the heating, ventilating and air conditioning system. The HVAC Subcontractor shall deposit such waste and debris in a dumpster on-site. Dumpster shall be provided by the General Contractor. The General Contractor shall be responsible for the emptying of dumpster when required.
- B. The HVAC Subcontractor shall, at the completion of his work, remove from the school property all tools, equipment and surplus materials resulting from the installation of the heating, ventilating and air conditioning system.

1.21 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

1.22 SCHEDULE OF VALUES

- A. This Contractor shall, within thirty (30) days of the Contract award, submit to the Engineer a complete breakdown of the contract price to aid in determining the value of the installed work during the construction period. The cost breakdown shall be presented in two (2) forms. The first form shall correspond to the construction schedule with percentage or progress to complete breakdown with progress description by month. The second form shall be a more detailed form. Each building block shall be listed individually with breakdown expressed in terms of major equipment and systems. In addition, each system cost shall be totalized.
- B. This Contractor's requisitions shall not be paid until the breakdown has been received by the Engineer and its form approved.

1.23 WARRANTY

- A. Refer to General Conditions of the specifications and, in addition, all work under this section shall be guaranteed free from defects in workmanship or materials for a period of one (1) year from the date of final acceptance of the system installed. Any such defective work developing during this period, unless such defects are clearly the result of misuse of equipment by persons not under the control of this Contractor shall be replaced by this Contractor without cost to the Owner. Where such defective work results in damage to work of other sections of the specifications, all such work shall be restored to its original condition by mechanics skilled in the affected trade, at the expense of this Contractor. This Contractor shall submit a separate written guarantee stipulating the aforesaid conditions.
- B. Standard equipment guarantees offered by the manufacturer for one year or greater shall be in addition to that as required by this Contractor. Copy of manufacturer's equipment guarantees shall be submitted with this Contractor's written guarantee.

PART 2 PRODUCTS

2.1 INSULATION MATERIALS (GENERAL REQUIREMENTS)

- A. All insulation materials to be furnished for installation under this section shall be as manufactured by Owens-Corning, Certainteed, Knauf, or Schiller Company.
- B. Shop drawings shall be submitted for all insulation system materials to be furnished for installation under this section. Submittals shall include descriptions of the application of all materials to be used for each insulation class and catalog cuts of all materials furnished.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- C. All insulation materials to be furnished for installation under this section shall conform to fuel contributed flame spread and smoke developed limits set forth in NFPA Standard 90A as determined by NFPA 255, ASTM E84 or UL723 tests.

2.2 INSULATION (SHEET METAL)

- A. Sheet metal work shall be insulated as specified herein and as indicated on the drawings.
- B. Insulation shall be applied to the following:
1. All air conditioning systems ductwork and associated equipment exposed to view; all systems outside air plenums, ducts and louver boxes; all system exhaust air plenums, ducts and louver boxes from louver connections back to automatic dampers. All portions of heating and ventilating and air conditioning unit casings not internally insulated, all air conditioning systems return air fans and all equipment shall have Class 131 insulation.
 2. All concealed air conditioning system supply and return air ductwork and associated equipment including terminal box reheat coil casings, shall have Class 135 insulation.
 3. Insulation liner shall be provided where indicated on the drawings. Refer to sheet metal work.
 4. All sound attenuators in insulated system ductwork shall be insulated. Sound attenuator sections furnished with Rooftop air handling units shall be insulated in field when not furnished insulated by the unit manufacturer.
 5. Acoustically lined ductwork shall be wrapped with class 135 insulation such that the total insulation system achieves a minimum "R" value of R-6.
- C. Insulation shall be omitted from the following sheet metal work:
1. Toilet, locker and storage exhaust ductwork except where noted on drawings.
- D. All louver plenums, louver blank-off plates and ductwork which will conduct air shall have insulation thickness increased to a minimum of 2 inches or as indicated on drawings.
- E. All supply and return ductwork located outside shall have rigid board insulation with thickness increased to a minimum of 3 inches and be provided with a weatherproof cover in addition to the vapor barrier.
1. Class 131
 - a. Insulation shall consist of 1½ inch thick minimum 4 pound density rigid fiberglass board with reinforced foil vapor barrier cut to fit duct shape and applied by impaling insulation on pins attached to duct surface. Pins shall be located approximately 1 per square foot of surface. Insulation shall be secured on pins using metal washers with excess pin length trimmed. Seal seams and all vapor barrier penetrations using 4 inch wide reinforced foil tape self-sealing type or secured using vapor seal adhesive.
 - b. Note: Flanges protruding from sheet metal shall be covered with 4 inch wide insulation board strips and sealed with 4 inch wide reinforced tape secured with vapor seal adhesive.
 - c. Finish shall consist of pre-sized glass fabric jacket applied to insulation surface and secured with lagging adhesive. All plenums and ducts within 5 feet of floors shall have edges reinforced with metal corner beads applied to insulation and sealed with 4 inch reinforced foil tape secured with vapor seal adhesive prior to finish.
 2. Class 135
 - a. Insulation shall consist of minimum 2 inch thick flexible fiberglass blanket with reinforced foil vapor barrier with a minimum installed "R" value of R-

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

6. Insulation shall be tightly wrapped around duct and secured using bonding adhesive covering not less than 50 percent of sheet metal surface. Seams and penetrations shall be sealed by using 4 inch wide reinforced foil tape self-sealing type or secured with vapor seal adhesive. The bottom of ducts over 24 inches wide shall have additional support for blanket consisting of pins attached to duct surface at a rate of 1 per 2 square feet, evenly spaced. Insulation shall be impaled on pins and secured using mechanical washers with excess pin length trimmed.

2.3 MOTORS

- A. This section identifies basic requirements for motors. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.
- B. Quality Assurance:
 - 1. Comply with NFPA 70 "National Electrical Code".
 - 2. NRTL Listing: Provide NRTL listed motors.
 - a. Term "Listed": As defined in "National Electrical Code", Article 100.
 - b. Listing Agency Qualifications: "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
 - 3. Comply with NEMA MG 1: "Motors and Generators".
 - 4. Comply with UL 1004: "Motors, Electric".
- C. All motors provided for this project shall comply with the requirements of this section, except as otherwise indicated.
 - 1. Motors 1/2 HP and Larger: Polyphase
 - 2. Motors Smaller than 1/2 HP: Single phase.
 - 3. Frequency Rating: 60 Hz.
 - 4. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
 - a. 120V Circuit: 115 V – motor rating.
 - b. 208V Circuit: 200 V – motor rating
 - c. 240V Circuit: 230 V – motor rating.
 - d. 480V Circuit: 460 V – motor rating.
 - 5. Service factors indicated for motors are minimum values and apply at frequency and utilizing voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10 percent of motor voltage rating.
 - 6. Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.
 - 7. Temperature Rise: Based on 40 degree C. ambient except as otherwise indicated.
 - a. Enclosure: Totally Enclosed Air Over
- D. Polyphase Motors:
 - 1. General: Squirrel-cage induction type conforming to the following requirements except as otherwise indicated.
 - a. NEMA Design Letter Designation: "A" or "B"
 - 2. Multi-Speed Motors: Separate winding for each speed.
 - 3. Premium Efficiency Motors: Nominal efficiency equal to or greater than that stated in NEMA Standard Publication MG 1-2003, Tables 12-12 and 12-13 respectively.
 - 4. Variable speed motors for use with solid-state drives: Energy efficient, squirrel-cage induction, design B units with ratings, characteristics, and features

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- coordinated with and approved by drive manufacturer.
- 5. Internal thermal overload protection for motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.
- 6. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading of the application.
- 7. Rugged Duty Motors: Totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with nonhygroscopic material. External finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.
- 8. Motors for reduced in-rush starting: Coordinate with indicated reduced in-rush controller type and with characteristics of driven equipment load. Provide required wiring leads in motor terminal box to suit control method.

E. Single-Phase Motors:

- 1. General: Conform to the following requirements except as otherwise indicated.
- 2. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application:
 - a. Permanent Split Capacitor
 - b. Split-Phase Start, Capacitor-Run
 - c. Capacitor-Start, Capacitor-Run
- 3. Shaded-Pole Motors: Use only for motors smaller than 1/20 HP.
- 4. Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature rating of the motor insulation. Provide device that automatically resets when motor temperature returns to normal range except as otherwise indicated.
- 5. Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

2.4 PIPING MATERIALS

- A. All piping materials installed under this section shall be new and shall consist of the following materials of construction:

<u>System of Section</u>	<u>Piping Class</u>
Hot Water Supply and Returns	2
Relief Valve and Vent Lines	2
Drain Lines	2
Cooling Coil and Louver Condensate Pan Drains	20
Natural Gas	14

Note: Class 20 piping may be used in lieu of Class 2 piping for two-inch (2") and smaller diameter piping for hot water, chilled water and any size drain line.

- B. Class 2 Piping System

	<u>2 Inches and Smaller</u>	<u>2-1/2 Inches and Larger</u>
Construction	Screwed construction with	Butt-welded construction with

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

	screwed or flanged connections to equipment.	flanged connections to valves and equipment.
Piping	Carbon steel, Schedule 40, ANSI B36.10, ASTM A120.	Carbon steel, Schedule 40 to 8"; Schedule 30 for 10" to 18" Schedule 20 for 20" to 24"; ANSI B36.10, ASTM A53, Grade A or B (except that all steam and hydronic heating systems piping shall be Schedule 40).
Fittings	Malleable iron, 150 lb. class screwed ends, ANSI B16.3, ASTM A197.	Carbon steel, schedule to match piping, butt-weld ends, ANSI B16.9, ASTM A234, Grade WPA.
Couplings	Same as "Fittings" above.	
Unions	Malleable iron, 300 lb. class, screwed ends, ANSI bronze-to-bronze type, ANSI B16.5, ASTM A181, Grade 1.	Forged steel, 150 lb. ANSI Standard weld-neck type flange, ANSI B16.5, ASTM A181, Grade 1.
Flanges	Forged steel, 150 lb. ANSI standard screw-on type, ANSI B16.5, ASTM A181, Grade 1.	Same as "Unions" above.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

C. Class 14 Piping System:

All Pipe Sizes

Construction	Butt-welded construction with flanged connections to valves and equipment as required.
Piping	Black steel, Schedule 40, ASTM A53, Grade B.
Fittings	Black steel, Schedule 40, butt-weld ends.
Unions	Forged steel, 300 lb. ANSI standard, weld-neck type flange, ANSI/ASME/B16.1.
Flanges	Same as "Unions" above.

D. Class 20 Piping System

2 Inches and Smaller

2-1/2 Inches to 8 Inches

Construction	Soldered joint construction with threaded adaptors.	Screwed construction with flanged connections to valves and equipment.
Piping	Copper, Type L, hard drawn, ANSI H23.1, ASTM B88.	Carbon steel (galvanized), Schedule 40, ANSI B36.20, ASTM A120.
Fittings	Cast bronze or wrought copper, solder joint type, ANSI B16.19 or B16.22.	Cast iron (galvanized), 125 lb. class, screwed ends, ANSI B16.3, ASTM A197.
Couplings	Same as "Fittings" above.	Same as "Fittings" above.
Unions	Wrought copper, solder joint type, ANSI B16.19 or B16.22.	Malleable iron fittings (galvanized), 125 lb. ANSI standard, screw-on type, ANSI B16.1.

E. Flange Bolts and Nuts

1. CI to CI, CI to CS, CI to CB and CB to CB.
2. Bolts: ANSI, B181, ASTM A307, Grade B, square head, coarse threaded series, Class 2B fit.
 - a. CS to CS
 - b. Stud Bolts: ASTM A193, Grade B7, Class 2A fit.
 - c. Nuts: ANSI B18.2.2, ASTM A194, Grade B7, heavy hexagonal series, semi-finished, Class 2B fit.

F. Gaskets: For all pipe classes except as note:

1. Gaskets: Flat ring 1/16-inch thick rubber, Garlock Style 3100 graphite or equal. ADA rated for service.
2. For make-up water service and cooling tower water.
 - a. Gaskets: Full face 1/16-inch thick rubber, Garlock 22 or equal.
 - b. For fuel oil service:
 - i. Gaskets - Garlock 2021.

G. Solder for Class 20 Piping: 95-5 tin antimony or 95.5 lead-tin conforming to ASTM B32, allow Grade 5A.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2.5 PACKAGED ROOFTOP UNIT

A. Summary

1. The contractor shall furnish and install package multizone VAV rooftop air conditioning unit(s) as shown and scheduled on the contract documents. The unit(s) shall be installed in accordance with this specification and perform at the specified conditions as scheduled.
2. Packaged rooftop air conditioning units shall be manufactured by Trane.
3. Substitutions: Voluntary alternates may be submitted after award of contracts. The contractor however will be responsible for any costs to owner or engineer associated with the use of substituted product causing changes in electrical, mechanical or structural of the building. Increased utility costs associated with alternative unit selection likewise shall be paid by the installing contractor.
4. Substitutions must be selected and approved within 14 calendar days after award of contract. Alternates must still comply with the performance and features as specified with these specifications and indicated on the design documents. Any submitted alternates may be subject to a minimum \$450 design and review fee per instance, charged to the submitting contractor.

B. General Unit Description

1. Unit(s) furnished and installed shall be cooling only packaged rooftop as scheduled on contract documents and these specifications. Cooling capacity ratings shall be based on ARI Standard 360 testing requirements. Unit(s) shall consist of insulated weathertight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, filters, supply and/or exhaust motors and drives, unit controls.
2. Unit(s) shall be single piece construction as manufactured at the factory. Site assembled subassemblies will not be allowed.
3. Unit(s) shall be factory run tested to include the operation of all fans, compressors, heat exchangers, safeties, limits, and control sequences.
4. Unit(s) shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.
5. Units shall be dedicated down flow or dedicated horizontal airflow as manufactured.
6. Unit(s) shall be ASHRAE 90.1 Compliant

C. Unit Casing

1. Cabinet: Galvanized steel, phosphatized, and finished with a pre-applied baked polyurethane enamel. Cabinet surface shall be tested 500 hours in salt spray in compliance with ASTM B117. Fully gasketed removable access panels. Structural members shall be 14-gauge with access doors and removable panels of minimum 18 gauge. Provide 1/2-inch thick foil faced fiberglass insulation on all exterior panels and roof in contact with the return and conditioned air stream. Cabinet top cover shall be one-piece construction or where seams exist, it shall be double hemmed and gasket sealed.

D. Electrical Power Connections

1. Single point power supply to the unit shall be 3-phase. Unit shall be provided with internal transformer(s) as required for low voltage control operations.
2. Provide a factory-installed non-fused disconnect switch which satisfies NEC requirements for a service disconnect switch. Disconnect handle shall be accessible through the control box door such that high voltage power must be off before door can be opened.
3. Factory-made penetrations shall be provided for connection of all electrical wiring. These wiring provisions shall be through the unit's electrical penetration. Field penetrations of the unit base pan shall not be acceptable.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

4. Provide a factory-installed, 15A, 115V convenience outlet capable of ground fault protection.
 5. Unit shall include a phase monitor as standard that protects equipment from phase loss, phase reversal, and low voltage. Any fault condition shall produce a Failure Indicator LED and send the unit into an emergency stop condition. The entire unit with this option shall be cULus approved. If not, a field UL inspection is required.
 6. High Fault Unit Interrupt Rating (Short Circuit Current Rating-SCCR): A 65,000 Amp rating (480V) and 25,000 Amp rating (600V) shall be applied to the unit enclosure using a non-fused circuit breaker for disconnect switch purposes. Fan motors, compressors, and electric heat circuits shall be provided with series rated circuit breakers that will provide the unit rated level of protection. The unit shall be marked with approved cULus markings and will adhere to cULus regulations.
- E. Air Filters
1. Air Filters: Filters shall mount integrally within unit and be accessible through hinged access panels. Filters shall be two-inch thick standard efficiency throwaways.
- F. Fans - Supply
1. Provide forward-curved fan mounted with fixed pitch sheave drive assembly. Complete fans assemblies shall be statically and dynamically balanced.
 2. Supply fan to be provided with Variable Frequency Drive
 3. Fan shaft shall be mounted on grease lubricated ball bearings.
 4. All motors shall be circuit breaker protected.
- G. Gas Fired Main Heating Section
1. Completely assembled and factory-installed heating system shall be integral to unit, cULus approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping connection through side of unit.
 2. Heating section shall be factory run tested prior to shipment.
 3. Gas Burner shall be forced combustion type power burner, negative pressure gas valve, manual shut-off, hot surface ignition, and flame sensing safety control.
 4. Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Upon a failure to ignite, three attempts of ignition will occur before lockout of the ignition system.
 5. Combustion blower shall be centrifugal type fan with built-in thermal overload protection on fan motor.
 6. Modulating Gas Heaters shall be made from grades of stainless steel suitable for condensing situations. The heater shall have a turn down ratio of 2.5 to 1 for low heat and 5 to 1 for high heat.
- H. Fully Modulating Hot Water Re-Heating Section w/Multi-Zone Reheat Dampers
1. Completely assembled and factory installed hot water heating system shall be integral to unit. Threaded connection with plug or cap provided.
 2. Unit shall have fully modulating control over each zone of the hot water reheat section.
- I. Evaporator Coil
1. Provide heavy duty aluminum fins mechanically bonded to internally enhanced, copper tubes.
 2. Provide a thermostatic expansion valve for each refrigeration circuit. Factory pressure and leak test coils at 300 psi.
- J. Condenser Section

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1. Provide aluminum fins mechanically bonded to copper tubes. Factory pressurize and leak test to 450 psig.
 2. Provide integral subcooling circuit(s) to prevent premature refrigerant flashing and to insure maximum operating efficiency.
 3. Provide vertical discharge, direct drive fans with steel blades, and three phase motors. Fans shall be statically balanced. Motors shall be permanently lubricated, with built-in current and thermal overload protection in a weather tight casing.
- K. Refrigeration System
1. Compressor: Hermetic compliant scroll compressor operating at 3600 rpm with isolated mounting, centrifugal oil pump, oil sight glass, and discharge valve.
 2. Provide with thermostatic temperature motor winding control for protection against excessive temperatures caused by over-/under voltage operation or loss of charge. Also provide high and low pressure cutouts.
- L. VAV Zone System
1. Zoning layout shall mimic zone configuration of existing unit and curb.
 2. Zones shall be controlled by low leak custom Ruskin blade dampers, with aluminum airfoil construction, stainless steel jambs and rubber seals.
 3. All zones shall incorporate factory mounted Belimo actuators, wired to unit control panel and tested for proper operation prior to shipment.
 4. VAV system shall be factory packaged and fully programmed and tested for operation prior to shipment. Programming log shall be provided.
 5. Zoned reheat system shall be installed within each VAV zone. All Heat modules shall be easily removable from unit for inspection and service. Each heat module shall be UL listed, and unit powered and controlled.
- M. Exhaust/Return Section
1. 100% Fresh Air Tracking Power Exhaust Modulating power exhaust shall be available on all units and shall be factory installed. It shall assist with maintaining building pressurization by exhausting a proportional amount of the entering fresh air by mechanically linking the Fresh air damper to the exhaust air damper.
- N. Outdoor Air Section
1. Provide a fully integrated factory installed 100% modulating outside air economizer with unit return and barometric relief air dampers. Economizer operation shall be through microprocessor based primary temperature controls that automatically modulate dampers to maintain space temperature conditions.
 - a. Provide economizer with comparative enthalpy control.
 - b. Provide adjustable minimum position control located remotely in the space.
 - c. Provide spring return motor for outside air damper closure during unit shutdown or power interruption.
 2. Provide Outside Air Measurement (Traq). A factory mounted airflow measurement station (Traq) shall be provided in the outside air opening to measure airflow. The airflow measurement station shall measure from 40 cfm/ton maximum airflow. The airflow measurement station shall adjust for temperature variations. Measurement accuracy shall meet requirements of LEED IE Q Credit 1 as defined by ASHRAE 62.1-2007.
- O. Dampers
1. Provide dampers with a leakage rate not to exceed 2.5% of nominal airflow. Leakage rates shall be based on one inch W.C. static pressure.
 2. Leakage rate shall be determined in accordance with AMCA Standard 575.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

P. Unit Controls

1. General: Microprocessor controls shall be provided for all 24 volt control functions. The resident control algorithms shall make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring indoor and outdoor temperatures. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized microprocessor shall provide anti-short cycle timing and time delay between compressors to provide a higher level of machine protection.
2. Variable Air Volume Controls: Provide all necessary controls to operate a VAV-Multizone rooftop from supply air temperature and space temperature including supply air microprocessor controller, and supply air sensor. The microprocessor shall coordinate the economizer control and stages of cooling with supply air temperature reset capability based upon space temperature.
3. The following setpoints shall be accessible in the unit control panel: supply air cooling setpoint, morning warmup setpoint, static pressure setpoint, and static pressure deadband.
4. Unit shall have 9 independent zones of control. All zones shall have a wired space thermostat. All zones shall be provided with factory installed and unit controlled hot water reheat coils.
5. Variable Air Volume controls with Variable Frequency Drive: Provide variable air volume supply air temperature control with variable frequency drive. Provide all necessary controls to operate a VAV rooftop from supply air temperature including microprocessor controller and supply air sensor. The microprocessor shall coordinate the economizer control and stages of cooling with supply air temperature reset capability based upon temperature (55°F). Variable frequency drive shall be factory installed and tested to provide supply fan motor speed modulation based upon the supply air static pressure setpoint.
 - a. The following setpoints shall be accessible in the unit control panel: supply air cooling setpoint, morning warmup setpoint, reset setpoint, reset amount, static pressure setpoint, and static pressure deadband.
 - b. Compensated Outside Air Control - shall be provided to control outside air damper positioning, maintaining minimum outside air requirements, during operation of variable air volume (VAV) systems.
6. Control Functions: Include unit scheduling, occupied/unoccupied mode, start-up and coast-down modes, nighttime free-cool purge mode, demand limiting, night setback, discharge air set point adjustment, timed override and alarm shutdown.
7. Diagnostic Functions shall include: Unit operating mode, Unit failure status, cooling failure, [heating failure,] emergency service stop indication, supply fan proving, timed override activation, high temperature thermostat status, Zone temperature, Supply air temperature, Cooling status (all stages), Stage activated or not, Stage locked out by UCP, HPC status for that stage, Compressor disable inputs, [Heating status,] Number of stages activated, High temperature limit status, [Economizer status,] [Enthalpy favorability status,] [Requested minimum position,] [Damper position,] [Dry bulb/enthalpy input status,] [Outside air temperature,] [Outside relative humidity,] Sensor Failure: [Humidity sensor,] [OAT sensor,] SAT sensor, RAT sensor, Zone temperature sensor, Mode input, Cooling[/heating] setpoints from sensors (CV only), [Static pressure transducer,] Unit mounted potentiometer, SAT from potentiometer (VAV only), Air reset setpoint from potentiometer (VAV only), Unit Configuration data, [Gas or electric heat,] [Economizer present,] High temp input status, Local setpoint, Local mode, [Inlet Guide Vane position/VFD %].
 - a. Unit operating mode
 - b. Unit failure status
 - c. Cooling failure
 - d. Emergency service stop indication
 - e. Supply fan proving

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- f. Timed override activation
 - g. High temperature thermostat status
 - h. Zone temperature
 - i. Supply air temperature
 - j. Cooling status (all stages)
 - k. Stage activated or not
 - l. Stage locked out by UCP
 - m. HPC status for that stage
 - n. Compressor disable inputs
 - o. Number of stages activated
 - p. High temperature limit status
 - q. Economizer status
 - r. Enthalpy favorability status
 - s. Damper position
 - t. Outside air temperature
 - u. OAT sensor (Fail/Normal)
 - v. SAT sensor (Fail/Normal)
 - w. RAT sensor (Fail/Normal)
 - x. Zone temperature sensor (Fail/Normal)
 - y. Mode input (Fail/Normal)
 - z. Cooling/heating setpoints from sensors (CV only) (Fail/Normal)
 - aa. Static pressure transducer (Fail/Normal)
 - bb. Unit mounted potentiometer (Fail/Normal)
 - cc. SAT from potentiometer (VAV only) (Fail/Normal)
 - dd. Air reset setpoint from potentiometer (VAV only) (Fail/Normal)
 - ee. Unit Configuration data
 - ff. Gas heat
 - gg. Economizer present
 - hh. High temp input status
 - ii. Local setpoint
 - jj. Local mode
8. Provide capabilities for Boolean Processing and trend logs as well as "templated" reports and logs.
- Q. Building Management System
- 1. Interface control module to Energy Management System to be furnished by rooftop unit manufacturer. Through this interface module, all Energy Management functions (specified in Energy Management Section) shall be performed. See Building Automation and Automatic Temperature Control System Specifications. The interface module with necessary controls and sensors shall all be factory mounted (not field mounted). If not furnished by rooftop unit manufacturer, this shall be furnished by Energy Management System Contractor for field mounting by said contractor and rated for service up to 140 F. The only field connection to Energy Management System shall be a single communication link.
- Q. Roof Curb
- 1. Replacement multizone unit shall fix exactly on existing roofcurb.
- R. Examination
- 1. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
 - 2. Verify that proper power supply is available.
- S. Gas Fired Boiler
- 1. The boiler shall be a Lochinvar Knight having a modulating input rating of

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- 285,000 Btu/Hr, an output of 270,750 Btu/Hr and shall be operated on Natural Gas. The boiler shall be capable of full modulation, firing down to 20% of rated input with a turndown ratio of 5:1.
2. The boiler shall be of a fire tube design and shall be vertically down fired. The boiler shall bear the ASME "H" stamp for 80 psi working pressure and shall be National Board listed. The heat exchanger assembly shall be fully welded through an automated process to ensure weld integrity. The 439 stainless steel combustion chamber and tubes shall be self-cleaning and designed to drain condensation to the bottom of the heat exchanger assembly. A built-in stainless steel flue collector shall allow condensation to drain from the heat exchanger assembly and into the external condensate trap. The complete heat exchanger assembly shall carry a twelve (12) year limited warranty.
 3. The boiler shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fiber outer covering to provide modulating firing rates. The boiler shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The boiler shall operate in a safe condition at a derated output with gas supply pressures as low as 4 inches of water column.
 4. The boiler shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The BOILER shall be equipped with; a pressure gauge, high limit temperature control certified to UL353, ASME certified pressure relief valve, outlet water temperature sensor, return water temperature sensor, a UL 353 certified flue temperature sensor, outdoor air sensor, low water flow protection (not a flow switch) and built-in adjustable freeze protection.
 5. The boiler shall be factory wired for single point power. Supply voltage shall be 120 volt / 60 hertz / single phase with a total amp draw of 1.5A.
 6. The boiler shall be installed and vented with a Direct Vent Vertical system with a vertical roof top termination of both the vent and combustion air. The flue shall be CPVC sealed vent material terminating at the roof top with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the BOILER from the outside. The air inlet pipe shall be PVC sealed pipe. The air inlet must terminate on the roof top with the manufacturer's specified air inlet cap. All venting installations shall be in accordance with the latest edition of the National Fuel Gas Code, ANSI Z223.1, or applicable provisions of local building codes.
 7. The boiler shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of 20 ppm or less corrected to 3% O₂. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.
 8. All unit installations must be in accordance with the National Fuel Gas Code ANSI Z223.1 (NFPA 54) in the US and Can/CGA-B149 Installation Code in Canada and all applicable local codes and ordinance requirements. Field installation includes gas piping, condensate drain/trap and flue venting per local codes.
- T. System Pump
1. The Grundfos system pump shall be specifically designed for heating systems. UPS Series pump is of the canned rotor type, i.e. pump and motor form an integral unit without shaft seal and with only two gaskets for sealing. The bearings are lubricated by the pumped liquid. Other features include 3ph two-speed

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

motors, stainless steel rotor can, bearing plate, stator housing in aluminum alloy, cast iron housing and built-in thermal overload switch. The Lochinvar boiler will control the operation of the pump motor starter.

- U. Panel Heater
 - 1. The boiler sheet metal enclosure will be equipped with a panel heater to maintain proper cabinet temperatures. The heater element is controlled by an adjustable thermostat which will turn off the heater when the set cabinet temperature has been achieved and on once the cabinet temperature falls below the set value. The indicator light will show when the heater is on/off. The fan operation will be enabled during the AUTO mode.

- V. Installation
 - 1. Install in accordance with manufacturer's instructions.
 - 2. Mount units on factory-built roof mounting frame providing watertight enclosure to protect ductwork. Install roof mounting curb level.
 - 3. Sheet metal transitions from the unit's zoned discharge to the existing ductwork distribution system will be required of the installing contractor.

- W. Manufacturer's Field Services
 - 1. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

- X. Warranty
 - 1. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.
 - 2. Provide a parts only five year compressor warranty.
 - 3. Provide a parts only ten year heat exchanger warranty.

- Y. Maintenance Service
 - 1. Furnish complete service and maintenance of packaged rooftop units for one year from Date of Substantial Completion by contractor.
 - 2. Include maintenance items as outlined in manufacturer's operating and maintenance data.

- Z. Extra Materials
 - 1. Provide one set of filters.

2.6 SHEET METAL WORK

- A. General: Ductwork systems shall be fabricated and installed in accordance with recommendations contained in the SMACNA "HVAC Duct Construction Standards", Third Edition 2005, and as herein specified. Tables and figures referred to hereinafter are taken from the SMACNA publication.

- B. Duct Pressure Classes: As shown on drawings. Where no specific duct pressure class designations are provided on drawings, the 2 inch water gauge pressure class is the basis of compliance with the standards, regardless of velocity in the duct, except when the duct is variable volume supply or designated exhaust. All variable volume ducts upstream of VAV boxes have a 3 inch WG basis of compliance when the drawings do not give pressure class. All AC unit discharge plenums of VAV systems shall have a 6 inch WG basis and the ductwork to the first branch take-off a 4 inch WG basis of compliance when the drawings do indicate a pressure class. Negative pressure ductwork between lab hoods and exhaust fan inlet shall be 5 inch water gauge pressure class. Snaplock construction is not permitted. Refer to NFPA for Smoke Exhaust Ductwork Gauge Requirements.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- C. Casings and Plenums: Casing and plenum sheet metal gauges, reinforcing and construction details shall be in accordance with Figures 6-1 through 6-12. Intake and exhaust plenums shall be sealed liquid tight and drained. Where through-louver drainage cannot be achieved, a 1 inch drain connection with serviceable 3 inch deep trap, shall be provided within a heated space to prevent freezing, and piped to the nearest floor drain. Bottom of plenums shall pitch toward drainage openings.
- D. Hangers and Supports: Ductwork sheet metal supports shall be in accordance with Chapter IV, including all plenum and casing sheet metal which is suspended.
- E. Sealing: All duct joints and air device connections shall be sealed in accordance with Table 1-2 except that all supply systems shall be sealed Class A. The sealant shall be Hardcast 550 with imbedded fabric, except for joints with dissimilar metals then a lead gasket shall be provided. Louver plenums shall be sealed water tight to a height of 12 inches above the plenum bottom.
- F. Branch Take-Offs: Branch main take-offs for round ductwork shall be 45 degree lateral tap and where terminal boxes occur, shall be 45° angle entry in accordance with Figure 2-6.
- G. Elbows: Elbows for round ducts shall be stamped type elbows with centerline radius equal to 1.5 times duct diameter. Where space is limited, the centerline radius may be reduced to 1.0 times the diameter for only those ducts entering into corridor ceiling spaces from vertical duct shafts. Elbows for rectangular and oval ductwork shall have a centerline radius equal to 1.5 times the duct width.
 - 1. Where space is restricted, square throat elbows with single or double thickness turning vanes may be used. Elbows shall be in accordance with Figure 2-2 except that throat types RE-4, RE-6, RE-7, RE-9 and RE-10 are specifically prohibited. Provide an access door upstream of all square throat elbows with single (or double) thickness turning vanes.
- H. Transitions and Offsets: Transitions in round ducts shall be conical reducers. Transitions in rectangular ducts shall be in accordance with Figure 2-7 except that offset type 1 and offset type 2 are specifically prohibited.
- I. Flexible Connections: Flexible connections shall be in accordance with Figure 2-17. Flexible connectors shall be installed to provide alignment of equipment and devices with ducts in operating positions. Provide on the inlet and outlet side of all air moving equipment incorporating rotating elements. Connections shall be of glass fiber reinforced neoprene captured by a fingered metal band at each edge. Maintain a maximum three inch (3") separation and a minimum 1½ inch separation between the connected devices such that a standard four inch (4") connector will be installed slack.
- J. Access Doors: Access doors in sheet metal ducts shall be provided with sash locks. Access doors in casings and plenums shall be provided with Type 2 locks (handles). All doors shall be hinged. Door insulation shall match adjacent casings. Doors shall be provided on all plenum and mixing sections, fire dampers, smoke dampers, combination fire/smoke dampers, reheat coils (inlet side), air valves and terminal filter equipment.
- K. Volume Dampers: Volume dampers shall be in accordance with SMACNA except that, in addition to those indicated on drawings, each branch main and branch shall be provided with damper typical to locations indicated in Figure 2-1. Additional dampers shall be provided where shown on plans, details and where specified elsewhere. Damper gauge to be two (2) gauges heavier than the duct in which they are mounted. Provide with locking quadrants or push rods and pillow blocks as appropriate. Dampers shall be sufficiently large to extend the full width of the branch duct to which it is attached. Provide scooped profile.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- L. Fire Dampers and Smoke Dampers: Fire and smoke dampers shall be in accordance with National Fire Code NFPA 90A Standard requirements and bear an Underwriters label. Dampers shall be installed in accordance with manufacturer's installation instructions. Dampers shall be UL listed, labeled, and shall be dynamic-static designed in accordance with UL Standard 555. Dampers shall be listed to support the appropriate fire rating required for wall and/or floor penetrations served. Dampers in lined ducts shall be in accordance with Figure 2-22. Where required as a condition of damper listing, provide slip joint. To permit breakaway, no screws, rivets, bolts or other fasteners shall be used; each joint shall have an access door as applicable. Provide an access door in the duct to service fusible link. Access doors for insulated ducts shall be double wall insulated sandwich type. Fire dampers shall be out of air stream Type B or C. Combination fire/smoke dampers may be used in lieu of separate dampers. All smoke dampers and combination fire/smoke dampers shall be furnished with pneumatic or electric actuators and appropriate UL label. Provide 10 gauge welded sleeve where dampers can not be placed directly into the fire and/or smoke wall.
- M. All smoke dampers and fire/smoke dampers shall be supplied with electric/electronic actuators, 165 degree F. "McCabe Link" (for use in general HVAC ductwork), 185 degree F. "McCabe Link" (for use in smoke control exhaust ductwork). All fire/smoke dampers shall be capable of being reset remotely. All fire/smoke dampers shall be supplied with one (1) end switch that will indicate both full closed and full open. All fire/smoke dampers shall fail open upon loss of control signal. All smoke dampers shall fail closed upon loss of control signal.
1. Except where specifically noted otherwise, the maximum permissible pressure drop for any fire damper at air flow quantity required by Design Documents shall not exceed 0.1 inches of water.
 2. Except where specifically noted otherwise, the maximum permissible pressure drop for any smoke damper assembly at air flow quantity required by design documents shall be as follows:
 - a. Up to 1,000 FPM 0.05 Inches of Water
 - b. 1,000 to 2,000 FPM 0.10 Inches of Water
 - c. Over 2,000 FPM 0.20 Inches of Water
 3. Damper sizes shall be adjusted accordingly where required to reduce pressure drop.
 4. Installed dampers found to have pressure drops in excess of specified values shall be replaced at no additional cost to the Owner.
- N. All fire, smoke and combination fire/smoke dampers shall be dynamically rated for the following conditions:
1. Fan (VAV) Discharge to Terminal Units 3,500 FPM
 2. Fan (CV) Discharge to Reheat Coils 1,500 FPM
 3. Terminal Box/Reheat Coil Discharge to
 - a. Terminal Device (i.e. Diffuser) 1,000 FPM
 4. Return/Exhaust Terminal Device
 - a. (i.e. Register) to fan inlet 1,800 FPM
- O. Exposed Ductwork: All ductwork exposed to view, except in mechanical rooms, shall not be cross-broken or beaded. Where reinforcement cannot be eliminated by using heavy duty gauge, it shall be internal. Seams shall be of non-standing type and duct shall be cleaned and degreased to accept application of paint.
- P. Flexible Ductwork: Shall be manufactured in accordance with UL-181, Class 0 and the amended Standards of NFPA 90A. The flexible ductwork shall be tested and listed by UL under these standards.
1. Ductwork shall be fabricated of minimum 0.0065" thick, grade 3003 aluminum alloy incorporating a "0" temper.
 2. Spiral construction shall incorporate a continuous grooved seam, flat pipe lock, doubled over, to create an effective triple locking joint. Double locking seams

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- shall not be accepted.
3. Corrugations formed into the spiral tape impart rigidity and shall support duct flexibility. Corrugations shall not exceed 3% of the nominal duct diameter.
 4. Joints for securing to ductwork and/or equipment collars shall incorporate a reinforcing band around the circumference of the flexible duct and its connection point. Self-tapping sheet metal screws shall extend through the reinforcing band through the connecting collar, sandwiching the flexible ductwork between. Final air sealant shall be provided by Hardcast 550 with imbedded fabric.
 5. Where associated ductwork is specified to be insulated, matching thickness insulating jacket, complete with vapor barrier, shall be used.
 6. Length of flexible duct shall not exceed 48 inches except where specifically noted otherwise on drawings.
 7. Flexible ductwork shall not be used in conjunction with ductwork rated for 6 inches WG and higher. Flexible duct shall not be installed to penetrate any walls, ceilings, roofs, or floors.
 8. The intent of this specification section is to allow the use of flexible ductwork as a final connection to a terminal device. Bends shall not exceed 90 degrees or have a radius less than inside diameter of duct.
- Q. Exhaust systems serving bathrooms, shower rooms and similar rooms where the exhaust air may contain a high moisture content shall be constructed of aluminum and shall be sealed watertight and pitched to prevent any accumulation of moisture. Provide a trapped drain at all low points and at the base of each riser.
- R. Exhaust systems serving laboratory exhaust hoods shall be constructed of Type 316 stainless steel with externally welded, liquid tight joints, unless indicated otherwise on the drawings.
- S. Provide 24 gauge piping sheet metal protective covers, shields or saddles to protect piping insulation. Protective covers shall totally encapsulate any and all exposed HVAC piping within six feet (6') of finished floor. Shields and saddles shall extend a minimum of six inches (6") ahead and behind the projected footprint of the pipe support addressed and shall completely cover the lower 180° arc of the insulated piping.
- T. Acoustic Liner:
1. All ductwork noted on plans to be acoustically lined, shall have one-inch (1") thick "ToughGard R" duct liner with enhanced surface. Acoustical liner shall be composed of rotary-type glass fibers for superior acoustic performance. The fibers shall be bonded together with a thermosetting resin into a insulation blanket which is overlaid with a durable, water repellent, fire-resistant black composite air stream surface.
 2. Acoustic liner shall comply with ASTM C1071 for air velocities up to 6000 FPM.
 3. Acoustic liner shall comply with ASTM C1104 for vapor sorption.
 4. Acoustic duct liner shall have a minimum NRC rating of 0.70.

Note: Duct dimensions shown are of clear inside dimensions after application of liner.

2.7 SLEEVES, INSERTS AND OPENINGS

- A. General:
1. All penetrations for piping, ductwork and conduit in the building walls, floors and roof shall have sleeved or boxed openings except for interior wall of gypsum board and stud construction which are not fire or smoke rated.
 2. The HVAC Subcontractor shall be responsible for informing this Contractor of the construction schedule as to permit orderly inclusion of all sleeves, openings and

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

inserts. The HVAC Subcontractor shall furnish and install all sleeves, boxed openings and inserts as the work progresses. If the HVAC Subcontractor fails to provide the sleeves, boxed openings and inserts, he shall bear the cost of modifications necessary for their inclusion.

3. All cutting and patching shall be done by this Contractor. The HVAC Subcontractor shall not cut into any building construction without first having received permission from the Architect.

B. Sleeves:

1. This Contractor shall furnish all sleeves for the work and furnish all labor for installation.
2. Sleeves through exterior building walls or through concrete construction shall be Schedule 40 (galvanized) steel pipe. Sleeves through interior fire or smoke rated walls of gypsum and stud construction shall be 10 gauge sheet metal.
3. Sleeves shall be sized to provide a total of not less than 1/2 inch clearance around the piping, duct or conduit together with any insulation cover.
4. Sleeves for setting into walls shall be flush with finished construction. Sleeves for setting into floors shall be imbedded in concrete slab and extend approximately 1 inch above finished floors. Sleeves through floors of mechanical rooms shall be 12 gauge and shall extend 4 inches above the floor. Sleeves shall be provided with lugs or flanges to permit firm attachment to the building construction. Wall sleeves shall not be used as support points.
5. All sleeved openings within the building shall be sealed airtight using fire barrier caulking with a UL classification for use as a fire barrier penetration seal for walls and floors with up to a three-hour fire rating, expanded into place for the full depth of the sleeve. Sleeved openings through exterior walls and floor shall also be sealed outside using waterproof mastic.

C. Inserts:

1. Inserts or other type anchoring devices shall be provided for the support of piping, ducts, or equipment in masonry or concrete construction. Inserts shall be as specified under pipe supports.
2. The HVAC Subcontractor shall furnish and install all inserts.

D. Openings:

1. Openings shall be framed or boxed by the HVAC Subcontractor.
2. Floor openings into mechanical rooms shall be provided with 4 inch high concrete curbs around the entire opening perimeter. All wall openings shall be flush with both surfaces.
3. Fire damper frames to be set into masonry or concrete construction shall be set into place at the time of the construction of the respective floor or wall. Exterior plywood covers shall be applied to both sides of fire dampers to prevent damage prior to making duct connections.
4. Openings for the passage of ducts and piping shall have 1/2 inch clearance all around the finished piping or duct and insulation. Boxed openings for gang piping shall be provided with 18 gauge sheet metal on both sides of penetration secured to the opening perimeter cut to fit the pipe shape and the clearance space within the opening filled with fire barrier caulking with a UL classification for use as a fire barrier penetration seal for walls and floors with up to a three-hour fire rating, expanded into place so as to make the penetration airtight.

E. Escutcheon Plates: Escutcheon plates shall be provided for all pipe penetrations into finished spaces as follows:

1. Pipe penetrations shall have chromium plated spun or pressed brass two-piece hinged escutcheon covers sized to fit the piping and insulation (if any) outside diameter and cover pipe sleeve.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2. Duct penetrations shall be 28 gauge stainless steel strips fastened with stainless steel screws or bolts and sized to cover the duct with any insulation and the wall opening. Round ducts shall be provided with escutcheon plates as indicated above for piping.
3. Penetrations through finished floors shall have matching finish extension escutcheon sleeves sized to the escutcheon and finished in a neat, workmanlike manner.

2.8 SUPPLEMENTAL SUPPORT SYSTEM

- A. This Contractor shall provide all supplemental supports required to direct equipment and materials support loads to approved structural load bearing points. All mechanical equipment and systems shall be substantially supported without distortion or excessive vibration. The methods of support shall be as hereinafter described, except as otherwise noted on the drawings.
- B. The supplemental support system shall be substantial type with members sized to prevent equipment distortion or excessive vibration. The HVAC Subcontractor shall provide support components such that all equipment shall operate without objectionable noise or vibration being transmitted to the structure.
- C. The supplemental support system shall conform to requirements of this specification. Manufacturer's published characteristics referenced are intended as a guide only. The supplier shall verify support elements submitted are in accordance with specified materials and construction and are appropriately sized to accept and direct the proposed loading.
- D. All supplemental support elements shall be by one (1) manufacturer: Unistrut, B-Line or Telestrut. The acceptable standard or quality shall be as follows:
 1. Framing Members:
 - a. Nominal Size: 1 $\frac{5}{8}$ " x 1 $\frac{5}{8}$ " "U" channel
 - b. Body: Mild Carbon Steel, ASTM A570 Grade 33
 - c. Gauge: 12 Gauge (0.105" thick)
 - d. Slot Width: 7/8" nominal
 - e. Pre-Punching: 9/16" Diameter, 1/8" on center, 3 sides
 - f. Finish: Hot-Dipped Galvanizing, G90 weight, ASTM A123
 - g. Conformance: Metal Forming Manufacturers Association (MFMA) Standard Publication MFMA-1.
 2. Fittings:
 - a. Nominal Size: 1 $\frac{5}{8}$ " (length per device)
 - b. Shape: Per Service from Manufacturer's Standard Catalog
 - c. Body: Hot Rolled Mild Carbon Steel, ASTM A570, Grade 33
 - d. Gauge: 1/4" Nominal Thickness
 - e. Hole Size: 9/16" Nominal
 - f. Finish: Hot Dipped Galvanizing, G90 weight, ASTM A123
 - g. Conformance: Metal Forming Manufacturer's Association (MFMA) Standard Publication MFMA-1
 3. Accessories:
 - a. Nominal Size: Per Service from Manufacturer's Standard Catalog
 - b. Shape: Per Service from Manufacturer's Standard Catalog
 - c. Body: Hot Rolled Mild Carbon Steel, ASTM A570, Grade 33
 - d. Gauge: 1/4" Nominal Thickness
 - e. Hole Size: 9/16" Nominal
 - f. Conformance: Metal Forming Manufacturer's Association (MFMA) Standard Publication MFMA-1.
 - g. Rollers: Gray Cast Iron
 4. Nuts and Bolts:

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- a. Nominal Size: 1/2" diameter x (Size per device)
 - b. Body: Mild carbon steel, ASTM A570, Grade 33, and Case Hardened
 - c. Threading: Coarse, Unified & American, UNC Classes 2A and 2B
 - d. Mounting: Spring or non-spring
 - e. Finish: Electro-Galvanized, G90 weight, ASTM A123
 - f. Conformance: Metal Forming Manufacturer's Association (MFMA) Standard Publication MFMA-1
- E. Supplemental support system members shall be positioned to align with equipment support points for proper bolting.

2.9 AUTOMATIC TEMPERATURE CONTROLS

A. General

1. Furnish and install, as hereinafter specified, Direct Digital Control (DDC) Automatic Temperature Control equipment based on the Johnson Faculty Explorer (FX).
2. Supervision of the installation, preparation of detailed wiring diagrams, and check out, calibration, placing the system in operation and one year's guarantee shall be executed by skilled workmen having a minimum of five (5) years' experience in the installation of automatic temperature control systems.
3. The Automatic Temperature Controls Subcontractor shall guarantee all equipment and the complete system provided and/or furnished under this contract to be free from defects in materials and/or workmanship for a period of one (1) year. All work from the date of final acceptance by Owner found to be defective within the guarantee period shall be replaced free of charge. Furnish all services incidental to the proper performance of the temperature control system throughout the guarantee period.
4. Any equipment found to be defective under normal use and service within the guarantee period shall be replaced free of charge, at point of installation, by the Temperature Control manufacturer and he shall provide any service incidental to the proper performance of the control system throughout the guarantee period.
5. The DDC Contractor shall be fully licensed at the time of bid to do business in the job site area. The DDC Contractor must have a wholly owned factory branch office with a technical staff, complete spare parts inventory, and test and diagnostic equipment to keep systems in operation 24 hours per day, seven days per week. He shall have emergency service available in the local area for temperature control systems for which he is currently performing on-call emergency service 24 hours per day, seven days per week. Wholesale, distributor, or representative type ATC Contractors are unacceptable. This requirement will be strictly enforced.

B. Scope of Work

1. The ATC contractor shall furnish and install all equipment, accessories, and wiring required for a complete and functioning system.
2. The control system shall consist of, but not limited to all temperature controls as specified herein including all CPU's, DDCP's, CRT's, printers, sensors, software, thermostats, valves, actuators, dampers, damper operators, relays, control panels, and other accessory equipment and appurtenances, including electrical wiring, to fulfill the intent of the specifications and provide for a complete and operable system.
3. Provide actuators for equipment such as dampers, inlet guide vanes, etc., where such actuators are not provided by the equipment manufacturers. Refer to floor plans for location and numbers of required actuators. Actuators shall be Belimo, or equal. Coordinate requirements with the HVAC subcontractor.
4. All materials and equipment used shall be standard components, regularly

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

manufactured for this type of work and shall not be custom designed especially for this project. All components shall have been thoroughly tested and proven in actual use.

5. The Contractor shall furnish and install all control and interlock wiring for chillers, boilers, fuel oil, day tanks, alarms, emergency generators, etc. unless specifically and clearly stated to be provided by others.
6. The ATC contractor shall review and study all HVAC drawings and the entire specification to familiarize himself with the equipment and systems operation and to verify the quantities and types of dampers, operators, alarms, bells, etc., he has to provide. Numerous references to the ATC contractor are made throughout this specification identifying work to be performed under the HVAC section in addition to work specifically indicated under this paragraph. It will be assumed that, if no specific inquiries are made during the bidding period, the HVAC/ATC subcontractors have reviewed all requirements and interfaces between equipment and controls, to result in a complete, integrated and fully operational HVAC system.
7. The Automatic Temperature Control Contractor shall update the existing graphics to include the new and existing exhaust fans associated with this project.

C. Work by Others

1. Automatic temperature control valves, duct humidifiers and separable wells for immersion elements furnished by the control manufacturer shall be installed by the HVAC contractor under the ATC contractor's supervision.
2. Automatic dampers that are specified to be furnished by the ATC contractor shall be installed by the HVAC subcontractor, under the ATC contractor's supervision.
3. Concrete foundations shall be provided by the general contractor. The HVAC Contractor shall furnish dimensional drawings to the general contractor.
4. All finished painting required for the temperature control piping and equipment, shall be by the general contractor.
5. All cutting and patching necessary for the installation of the temperature control system, shall be by the HVAC contractor.
6. Installation of duct smoke detectors shall be by the HVAC subcontractor, under the ATC contractor's supervision.

D. Submittals and Shop Drawings

1. Submit shop drawings and obtain written review comments before ordering or installing any equipment or material.
2. Submit shop drawings of all equipment. Shop drawings shall consist of but not limited to manufacturer's scaled drawings, valves and damper schedules, cuts and catalogs, including descriptive literature which shall indicate the construction, material, physical dimensions and complete operating data. All ATC shop drawings shall also contain a written description of the Sequence of Operations, enumerating and describing the function of each component.
3. Submit the following for approval:
 - a. Control drawings with detailed wiring diagrams, including bills of materials and written sequences of operation, for each system type.
 - b. Valve and damper schedules showing sizes, configurations, capacities, pressure drops and locations of equipment. Include type and quantities of actuators.
 - c. Data sheets for control system components.
 - d. Complete software information including names of software packages provided, control sequences performed, complete information on user programmability (commands, language details, programming sequences, etc.), and detailed printouts of the actual software within each DDCP including user definable comment statements inserted throughout the program to guide a novice operator through the various

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- sequences of the actual program.
 - e. Calculations for valve coefficients (CVs).
 - f. Operators user's manuals.
 - g. Complete point-to-point check-out procedures to ensure that all physical points are consistently tested and verified for this project.

- E. Equipment Operation Instruction and Maintenance Manuals
 - 1. On completion and acceptance of the work, furnish for approval three copies of written instructions on the proper operation and maintenance of all equipment and apparatus furnished under this section.
 - 2. Each manual shall be provided with an index sheet listing the contents in alphabetical order and shall contain but not limited to the following material:
 - a. Updated copies of all submittal data and shop drawings as specified previously.
 - b. Manufacturer's instructions regarding the installation, maintenance and calibration of each component used in the ATC system installed by the ATC contractor.
 - c. Copies of all warranties and guarantees issued by each equipment manufacturer.
 - d. "As-built" interconnecting wiring diagrams and wire lists of the field installed system with complete, properly identified numbering of each system component and device.
 - e. A set of "User's Manual" detailing the operation of the Building Management and Control System (BMCS). The manual shall describe the hardware operation as well as provide instructions in computer access and programming. This manual shall be submitted under separate cover. The User Manual shall be written for an inexperienced user. It shall describe in layman's language, the functions and procedures of "using" the system.

- F. Acceptance Testing
 - 1. At substantial completion of the work, the ATC contractor shall prepare a punch list of all items remaining to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the ATC contractor to complete all work in accordance with the contract documents. This list shall be delivered to the engineer prior to the ATC contractor's request for formal acceptance testing.
 - 2. Additionally, the ATC contractor shall provide an equipment list and point list to the engineer prior to formal acceptance testing. Each material item and point must be initialed by the installing DDC technician that the item has been physically inspected for proper installation, functionality, and database entry.

The verification form shall be similar to the following:

DDC Floor	Point Cabinet #	Point Name	Point Type	Point Address	Sensor On/Off	Oper. Reading	Test Initials	Test Time Date
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- 3. The engineer will prepare a list of items to be corrected or completed that shall include the punch list items identified by the ATC contractor, and any additional items found to be incomplete or incorrect. All items on both lists shall be completed or corrected before acceptance testing may proceed. The ATC contractor shall notify the engineer when he is ready to proceed with the acceptance test that system is complete and operates as required by the contract documents.
- 4. Acceptance Test Procedure:
 - a. The ATC contractor shall demonstrate in the presence of the

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

commissioning agent that all functions of the ATC and BMCS systems are operating as specified in the contract documents, including any required change orders. The final checkout will include, but not be limited to, the following items:

- 1) Verification of the location, calibration and proper wiring/connection of all BMCS input and output devices.
- 2) All BMCS software and output functions shall be tested individually.
- 3) The proper operation and calibration of all ATC devices and actuators shall be verified individually.
- 4) When system performance is deemed satisfactory by the Architect, system parts shall be accepted for beneficial use. Warranty shall begin. All minor deficiencies found will be noted in writing by the Engineer. All deficiencies so noted shall be corrected by the ATC contractor before the final acceptance will be issued.
- 5) The ATC contractor shall allow sufficient time to complete the acceptance test procedure.

G. Training/Owner's Instruction

1. The ATC contractor shall provide three copies of an operator's user's manual describing all operating and routine maintenance service procedures to be used with the system as specified previously. The ATC contractor shall instruct the Owner's designated representatives in these procedures during the start-up and test period. The duration of the instruction period shall be no less than 24 hours and shall take place at the site.

H. Warranty

1. The ATC contractor shall guarantee the control system free from defects in material and workmanship and guarantee performance of the systems as required by the contract documents for one year of normal use and service beginning on the date the Owner has accepted the system.
2. The ATC contractor shall through the warranty period, schedule visits to the site in order to provide two seasonal system review sessions with the building operators. The intent is for system review to take place at the time of seasonal system changeover. The contractor shall establish diagnostic trend logs on the OWS for the purposes of evaluating all major systems in the building, and a sample of terminal systems. Following any calibrations and adjustments the logs shall be submitted to the Architect for review.

I. Products

1. The Building Management and Control System (BMCS) shall consist of Network Level 1 controllers and Level 2 DDC controllers to monitor and control equipment per the control sequences. Level 1 controllers shall provide overall system coordination, accept control programs, perform automated DDC and energy management functions, control peripheral devices and perform all necessary mathematical functions. The controller shall be a microcomputer of modular design. The word size shall be 16 bits or larger, with a memory cycle time of less than 1 microsecond. Level 1 controllers will share information with and from the entire network of Level 1 and Level 2 controllers for full global control. Level 1 controllers shall permit multiuser operation from workstations and laptop computers connected either locally or over the Level 1 network. Level 2 controllers, also referred to as local control units shall provide intelligent, stand-alone control of HVAC, lighting equipment, and access control. Each unit shall have its own internal RAM memory and will continue to operate all local control functions in the event of a failure to any Level 1 controller. In addition, it shall be

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

able to share information with and from the entire network for full global control.

- J. Communications Processing
1. The BMCS shall operate as a true token-pass peer-to-peer communication network. Resident processors in each Multi-purpose controllers shall provide for full exchange of system data between other Multi-purpose controllers on the high performance peer to peer communications network. Systems that limit data exchange to a defined number of system points are not acceptable.
 2. Systems that operate via polled response or other types of protocols that rely on a central processor or similar device to manage interpanel communications may be considered only if a similar device is provided as a stand-by. Upon a failure or malfunction of the primary device, the stand-by shall automatically, without any operator intervention, assume all BMCS network management activities.
 3. The failure of any Multi-purpose controller on the network shall not affect the operation of other Multi-purpose controllers. A panel failure shall be annunciated at the specified graphical workstation, alarm printers, or operator terminals.
- K. Multi-Purpose Controllers
1. Provide multi-purpose DDC controllers as required. Each multi-purpose controller shall be a microprocessor-based direct digital control unit and shall be capable of operating as a standalone controller on a high performance peer to peer network. Provide each multi-purpose controller with sufficient memory to operate in a truly independent manner; that is, each controller shall support its own inputs and outputs, operating system, database and programs necessary to perform control sequences and energy management routines. Additionally, each multi-purpose controller shall have sufficient memory to support the application specific controllers and LAN control panels connected to it over the local area networks.
 2. Each multi-purpose controller shall be capable of full operation either as a completely independent unit or as a part of the building-wide control system. All units shall contain the necessary equipment for direct interface to the sensors and actuators connected to it.
 3. Control strategies shall be owner definable at each multi-purpose controller, and for all control units in the system from any one operator terminal. Each control unit shall provide the ability to support its own operator terminal if so desired.
 4. Each multi-purpose controller shall include its own microcomputer direct digital controller, power supply, input/output modules, and battery. The battery shall be self-charging and be capable of supporting all memory within the control unit if the commercial power to the unit is interrupted or lost for a minimum of 100 hours. Upon a power failure at the remote unit, operator intervention shall not be required to maintain the database.
- L. Networking Communications
1. General - the network architecture shall consist of two levels. The top level shall be a high speed Ethernet LAN designed to support network controllers, central plant controllers, work stations and a file server. The second level shall be a RS485 Token passing bus to support a family of dedicated local controllers for control of HVAC equipment, lighting, and access control. The second level bus shall communicate bidirectionally with the high speed LAN through Level 1 controllers for transmission of global data.
 2. High Speed LAN - this Ethernet local area network shall operate at a minimum speed of 10 Mb/sec utilizing TCP/IP communications architecture. The high speed LAN will provide transfer of point data, alarms and file activity among Level 1 controllers, work stations and the file server. The high speed LAN shall support a minimum of 50 nodes consisting of Level 1 controllers or workstations. Any data from a Level 2 controller can also be transmitted onto this bus through a

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- Level 1 controller. The high speed LAN shall support multi-user communications and multi-session activity. That is, all global data sharing shall occur simultaneously with the transmission of alarm data or user activity.
3. Field Bus - the level 2 bus, or field bus, supports local control units of modular size for operation of the building's HVAC, lighting and access control systems. This RS485 bus shall operate at a minimum speed of 19200 baud, with a minimum length of 4000 feet or 32 nodes before requiring a network repeater. A minimum of 127 Level 2 controllers shall be configureable on the field bus. Manufacturers with baud rates of less than 19200 shall be limited to 64 Level 2 controllers to insure adequate global data and alarm response times. The field bus shall permit peer to peer communications among all Level 2 controllers and allow simultaneous communications with laptop computers that are connected to a Level 2 controller. Failure of the Level 1 controller will not impair the operation of its associated field bus.
 4. Network Transparency - all points contained on Level 1 and Level 2 controllers shall be considered global points. Any program in any controller on the network shall be able to reference any point in any controller regardless of its location on the network.
 5. Workstation Communications - workstations shall be connected directly to the high speed LAN. Workstations shall be able to communicate to any Level 1 controller, Level 2 controller, to additional workstations or the file server. Work stations shall also be able to communicate via modems to remote controllers via a RS232 connection. Telephone communications shall operate simultaneously with communication to any controllers connected on the high speed LAN.
 6. Laptop Communications - the laptop computer shall communicate with either Level 1 or Level 2 controllers. Through the laptop, operators shall be able to view points and change parameters on any Level 1 or Level 2 controller on the network.
 7. Dial-up Communications - it shall be possible to access the network remotely through a standard dial-up modem. This modem shall permit direct access to the high speed LAN via a Level 1 controller. It shall be possible to configure multiple modems in Level 1 controllers to enable multi-user communications when more than 1 telephone line is available.
- M. DDC Controllers:
1. A Level 1 controller has its own on-board CPU, clock/calendar, EPROM, RAM, ROM, communication port(s), and network connections to the high speed LAN and the field bus. The Level 1 controller may either have on-board or remote mounted I/O. Level 1 controllers are capable of complete standalone operation. Level 1 controllers are available with an optional user display. The firmware shall consist of the operating system, communication software, programming language, and resident control application software. The firmware may optionally contain user interface software to support dumb terminal operation. Where this is not provided the Level 1 controller must be optionally programmable from the laptop computer. The custom application software shall reside in battery backed RAM or EPROM. RAM will also be used for storing trend data and clock/calendar information. Level 1 controllers shall provide communication to both the high speed LAN and the field bus. In addition, a minimum of 1 RS232 or RS485 port shall be provided for connection to a workstation or laptop computer. When the port is RS232, it shall optionally support communication to a modem or printer. Where multiple RS232 ports are available, multi-user communications shall be supported.
 2. Analog Inputs - the Analog Input (AI) function shall monitor each analog input, perform A/D conversion, and hold the digital value in a buffer for interrogation. The A/D conversion shall have a minimum resolution 12 bits. Input ranges shall

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- be within the range of 0-10 VDC or 4 - 20 mA.
3. Digital Inputs - the Digital Input (DI) function shall accept dry contact closures and voltage level transitions. A voltage level below 1 volt shall be read as ON (closed), a voltage level above 3 volts shall be read as OFF (open).
 4. Pulse Accumulator Inputs - the pulse accumulator input function shall have the same characteristics as the DI, except that, in addition a buffer shall be included to totalize pulses between interrogations. Each input shall accept pulses at a minimum of 2 per second.
 5. Temperature Inputs - temperature inputs originating from a thermistor, shall be monitored and buffered as an AI, and provide automatic conversion to degrees F or C without any additional signal conditioning.
 6. Input Wiring - all inputs shall be two wire devices and shall not require shielded wire for accurate operation.
 7. Outputs - output types shall include digital, universal and tri-state. Outputs shall be available with built-in hand-off-auto switches for local overrides.
 8. Digital Output - the Digital Output (DO) function shall provide contact closure for momentary (Pulse Width Modulation) and maintained operation of field devices. Output pulse width shall be selectable between 0.1 and 3200 seconds with a minimum resolution of 0.1 seconds. Isolation and protection against voltage surges up to 180 VAC peak shall be provided. Contact rating shall be a minimum of 1 amps at 24 VAC. Each digital output shall be equipped with an optional ON/OFF/AUTO switch to manually obtain either output state. Manual overrides shall be reported to the controller at each update. An LED shall be provided to indicate the state of each digital output.
 9. Universal Output - a Universal Output shall provide 0-20VDC, 0-20 mA control signal (with a maximum resolution of .1 volt and .1 mA), and standard Form C relay operation (1 amps, 24 VAC). It shall be possible to select the mode of output operation for each output by simply wiring to the appropriate terminations on the controller. No circuit boards or output cards shall have to be exchanged to select the desired output mode.
 10. A three-position manual override switch shall allow selection of the ON, OFF, or AUTO output state. In addition each UO shall be equipped with an override potentiometer to allow manual adjustment of the analog output signal over its full range, when the 3 position manual override switch is placed in the ON position.
 11. The Form C output mode shall be capable of standard digital output operation including pulse width modulation.
 12. All current outputs shall be fuse protected to 120VAC.
 13. Tri-State Outputs - tri-state outputs shall consist of two 24VAC relays for control of bi-directional motors and actuators. Each tri-state output is capable of PWM (pulse width modulation) to a resolution of .1 second.
- N. DDC Controller Resident Software Features
1. General:
 - a. All necessary software to form a complete operating system as described in this specification shall be provided.
 - b. The software programs specified in this Section shall be provided as an integral part of DDC Controllers and shall not be dependent upon any higher level computer for execution.
 2. Control Software Description:
 - a. Software Description - The application software shall be configured for each Level 1 controller either locally through a laptop computer or through a workstation. Level 1 controllers shall contain PROM as the resident operating system. Application software will be RAM resident. Application software will only be limited by the amount of RAM memory. There will be no restrictions placed on the type of application programs in the system.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

Each Level 1 controller shall be capable of parallel processing, executing all control programs simultaneously. Any program may affect the operation of any other program. Each program shall have the full access of all I/O facilities of the processor. This execution of control function by Level 1 controllers shall not be interrupted due to normal user communications including; interrogation, program entry, printout of the program for storage, etc.

- b. Real-Time Operating System - Provide a real time operating system in PROM memory requiring no operator interaction to initiate and commence operations. The program shall include:
 - 1) Operation and management of all devices.
 - 2) Error detection and recovery from arithmetic and logical faults
 - 3) Editing software to allow the user to develop or alter application programs.
 - 4) System self-testing
 - 5) Multi-user.
 - 6) Multi-tasking.

- c. Editor - When programming a controller through either a dumb terminal or laptop computer, editing and word processing features will include as a minimum:
 - 1) Cut, copy, paste, and undo.
 - 2) Search and replace.
 - 3) Comments.
 - 4) Scrolling.
 - 5) Character, line, and page cursor control.

When programming in terminal mode, the system will allow full screen, character editing for correction or modification of any portion of a program. Syntax errors will be highlighted, and programmers must make corrections prior to the program being compiled. When programming Level 2 controllers, the programming environment will be identical to Level 1 programming with automatic uploading and downloading of the compiled code to the controller.

- d. Point Identification - Users must be able to assign unique identifiers for each connected point. Identifiers must have at least twelve alpha/numeric characters. All references to these points in programs, reports, and command messages shall be by these identifiers. Each point name can have up to a 40 character description, and optionally engineering units (up to 8 characters).

- e. User Programming Language - The application software shall be user programmable. This includes all strategies, sequences of operation, control algorithms, parameters, and setpoints. The source program shall be English language and programmable by the user. The language shall be structured to allow for the easy configuration of control programs, schedules, alarms, reports, telecommunications, local displays, mathematical calculations, passwords, and histories. The language shall allow the creation of timers anywhere in the logic of a program. Each timer shall increment in seconds and increment to a maximum of 365 days. The language shall be self-documenting. Users shall be able to place comments anywhere in the body of a program. Program listings shall be configurable by the user in logical groupings.

- f. Application Software - The system shall contain include ROM based, built-in software modules for the creation of standard application programs. Modules will include as a minimum:

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- 1) PID Algorithm
 - 2) Self-tuning PID
 - 3) Calendar Functions (Seconds, minutes, hour, day of week, day of month, day of year, month and year)
 - 4) Curve fit
 - 5) Optimum Start
- g. Mathematical Functions - Each controller shall be capable of performing basic mathematical functions (+,-,X,/), squares, square roots, exponential, logarithms, boolean logic statements, or combinations of both.
The controllers shall be capable of performing complex logical statements including operators such as >,<=, and,or,exclusive or, etc. These must be able to be used in the same equations with the mathematical operators and nested up to five parenthesis deep.
- h. Passwords - Level 1 controllers will have up to 8 levels of passwords. The highest level will allow access to all functions within the system. The remaining 4 levels will be definable by the user to include any subset of system commands.
- i. History Logging - Each controller shall be capable of logging any system variable over user defined time intervals ranging from 1 second to 1440 minutes. Any system variables (inputs, outputs, math calculations, flags, etc.) can be logged in history. A maximum of 32767 values can be store in each log. Each log can will record either the instantaneous, average, minimum or maximum value of the point. Logs can be automatic or manual.
If shall be possible to find the average of a log, the standard deviation, the sum, minimum or maximum. It shall also be possible to reference any value within a log for use in a control program.
- j. Reporting - The system shall be able to create user definable reports containing any combination of text and system variables. Report templates will be created by users in a word processing environment. Reports can be displayed based on any logical condition or through a user command.
Numerical displays shall be up to 10 digits in length, with up to 4 digits to the right of the decimal point. The format of each numerical display shall be user definable.
- k. Alarming - For each system point, alarms can be created based on high/low limits or conditional expressions. All alarms will be tested each scan and can result in the display of one or more alarm messages or reports. Messages and reports can be sent to the optional display panel, a local terminal, to the Host Computer, via modem to a remote computing device.
- l. Debugging Tools - The language shall have built in program debugging tools for program simulation and error detection.
When a control program is placed in a debug mode, a continuous record shall be kept of the last 128 steps before discarding the oldest data. Up to 4 control programs can be placed in a debug mode concurrently.
- m. Overriding Programs - It shall be possible to disable any point in the system and modify it to a user definable value. Any points that have been disabled will be kept in a log and viewable by an operator at any time.
- O. Electronic Sensors
1. All mixed air and coil discharge sensors shall utilize industry standard thermistor with averaging elements. Sensing elements shall be a minimum of 25 ft. and temperature sensed shall be averaged over the entire length of the element.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

2. Space type sensors shall have an accuracy of +/- .5 degrees over sensed temperature range (20/120F).
 3. Well type sensors used for liquid immersion shall have stainless steel removable wells. Sensing element shall have an accuracy of +/- .5 degrees over amperage draw of motor the range (70/220F or 20/120F) of the sensor. Each sensor shall have a suitable electrical box to enclose all wiring connections.
 4. Temperature control wells shall be installed by mechanical contractor under supervision of temperature control contractor.
- P. Smoke Detectors
1. The Electrical Contractor shall furnish smoke detectors to be installed in ductwork by the Sheetmetal Subcontractor. The Electrical Contractor shall wire from the detectors to the Rooftop Rooftop air handling unit control circuit for shutdown of fans. The Electrical Contractor shall wire the normally closed contacts in series to the fan starter holding coil. All wiring to smoke detectors shall be by the Electrical Contractor.
 2. All units shall utilize smoke detectors, as specified.
- Q. Safety Low Limit Thermostats
1. All fan systems introducing outdoor air with hot water coils shall be equipped with two safety low limit thermostats wired in series designed to stop the fan while closing the outdoor air damper any time the discharge temperature falls below 38 degrees. The safety thermostats shall utilize a 20 foot sensing element responsive to the lowest temperature along its entire length. Provide one thermostat for each 16 square foot coil surface as a minimum.
- R. Current Sensors
1. Current sensors shall be analog type, sensitivity dated for the application with a 4-20 ma or 0-10 Vdc output. Span and sensitivity shall be adjustable. Sensors shall be used for all fans and pumps.
- S. Air Static Pressure Transmitter
1. Transmitter shall have range of 0-1" or 0.5" w.g. and send a 4-20 milliamp output signal. Zero set range and span set range +/- 5% of full range output. A combined static error (non-linearity, non-repeatability, and hysteresis) +/- .5% of full range output.
- T. Building Management and Control System Wiring
1. All input and output control wiring to the control units shall be #18 twisted and shielded cable. All shield to be grounded at the control panel, shields at the sensors or transducers to be folded back and taped.
 2. Communication trunk wiring shall be #18 twisted and shielded cable. Trunk isolator/extenders shall be installed on either end of trunk.
 3. All cable splices shall have joints soldered and taped including the shield. No mechanical connections will be acceptable.
 4. No digital input or output points shall be more than 250 feet from its respective panel.
 5. All wiring within the panels must be made with connectors of appropriate size and design for the terminals being applied.
 6. All connections within the panels must be made with connectors of appropriate size and design for the terminals being applied.
 7. All cables must be labeled and identified on corresponding termination drawings. A copy of the termination drawing will be adequately protected and left in its respective panel.
- U. Control Wiring

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

1. Electrical work will be in accordance with NFPA 70, ANSI C2 and Division 16 of these specifications. Electrical wiring, terminal blocks and other high voltage contacts will be fully enclosed and marked to prevent accidental injury.
2. All wiring associated with the installation will be the responsibility of the Contractor. The term "wiring" is construed to include furnishing of wire, conduit, miscellaneous material and labor as required to install a total working system.
3. It is the responsibility of the Electrical Contractor to provide adequate connections and extensions from 120 volt power sources to the various items of equipment requiring power under this contract. Branch circuits serving equipment under this contract will be separate and used only for such equipment. All branch circuit conductors 120 volts or greater will be at least 14 gauge copper, type THW, 600 volt insulation, installed in minimum 3/4 inch conduit (EMT).
4. Transient Protection - All electronic equipment including processors, relays, monitoring devices, temperature sensors and other non-computerized solid state equipment will be adequately protected against power line transients or RFI interference. Equipment that fails to operate properly due to transient or other electrical interference, in the opinion of the Engineer, will be required to be retrofitted with the appropriate protection device(s).

2.10 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Trade Subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Trade Subcontractor, as referenced under Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

PART 3 EXECUTION

3.1 MATERIALS AND WORKMANSHIP

- A. All materials installed in this work shall be new, unless noted for re-use, without damaged functional or aesthetic components. All equipment finished shall be touched up with matching finishes where slight scratches occur. Equipment or material subject to severe deterioration shall be completely refinished or replaced as directed by the Architect.
- B. All labor utilized in the installation of work shall be experienced in the respective trade required. The installation of exposed finished materials shall be neatly done flush, straight and/or plumb, without distortion, meeting the building finished surfaces.
- C. All HVAC materials and equipment shall conform to the Standards listed within this Section of the Specifications and wherever such standards have been established, items shall bear its respective label.
- D. Where labor to be furnished must meet specific Code requirements, only individuals certified to do such shall be used.
- E. All equipment shall be installed in accordance with the manufacturer's instructions and recommendations with adequate clearance for access for maintenance.

3.2 COORDINATION

- A. This Contractor shall give full cooperation to other trades and to the General Contractor and shall furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay. If this Contractor installs his work before coordinating with other trades, he shall make the necessary changes in his

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

work to correct the condition, without extra charge. In areas, if due to construction conditions, more than one trade is required to use common openings in beams, and conduits, this Contractor must plan and locate the positions of the items of piping, ducts, and conduits, which are under the scope of his Contract with that of items under the scope of other Contractors, in order that all items are properly located and may be accommodated within the space available. Location and positioning shall be done prior to installation and to the satisfaction of the Architect and/or Engineer.

- B. This Contractor shall obtain detailed printed information from the manufacturer of equipment which he is to provide for the proper methods of installation. He shall also obtain all information from the General Contractor and other Contractors which may be necessary to facilitate his work and the completion of the whole project. All equipment shall be installed in strict accordance with manufacturer's recommendations.
- C. The work to be accomplished under this Section includes work within existing areas adjacent to the site of new construction. Continuity of services within existing areas shall be maintained. Any interruption of services necessary to accomplish the work shall be made only with the consent of the General Contractor and at such time(s) as the Owner designates.
- D. This Contractor shall not unnecessarily disturb or interfere with the Owner's use of the facilities associated with or adjacent to this Contract. When interference is necessary, permission shall be obtained from the General Contractor before any operation or service line is disturbed or disconnected.
- E. This Contractor shall include under coordination work the installation of all systems in conformance with governing codes. This Contractor is advised that no piping, ducts or equipment foreign to the electrical equipment shall be permitted to be installed in, enter or pass through such spaces or rooms provided for switchboards and panelboards in accordance with Article 384 of the National Electrical Code.
- F. Diffusers, grilles and registers located in the ceiling shall be located as shown on the Architectural Reflected Ceiling Plan and coordinated with ceiling grid, lights, and speakers. Items shown on the HVAC Drawings, but not located on the Reflected Ceiling Plan shall be coordinated to be located as indicated on the HVAC Drawings.

3.3 COORDINATION DRAWINGS

- A. Coordination Drawings shall be initiated under this Section of the Specifications. It is this Contractor's responsibility for preparation of project Coordination Drawings showing the installation of all equipment, piping, ducts and accessories to be provided under this Section of the Specifications. These Drawings shall be prepared at not less than 3/8 inch = 1'0" scale and shall show building room layouts, structural elements, ceiling grid, diffusers, registers, grilles, ductwork and lighting layouts out of function. A reproducible copy of each Drawing prepared shall then be submitted to each Contractor working under the Plumbing, Fire Protection and Electrical Sections of this Specification, who shall be responsible to coordinate their equipment and systems and shall show these on the Drawings submitted. After each Trade Contractor has fulfilled their obligations, they shall return the Drawings to the HVAC Contractor. After each Drawing has been coordinated between trades, each trade shall sign each Drawing indicating acceptance of the installation condition. This Contractor shall then print the coordination original, and these prints shall be submitted, through the General Contractor to the Architect, for review and comment, similar to Shop Drawings. Comments made on these Drawings shall result in a correction and resubmittal of the Drawings. A master small scale Drawing of the entire building shall be initially prepared showing all areas involved and the Drawing numbers covering each area.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

3.4 PROTECTION AND CLEAN UP

- A. This Contractor shall be responsible for maintenance and protection of all materials and equipment furnished by him during the construction period from loss, damage or deterioration until final acceptance by the Owner. All materials and equipment on the job site shall be stored and protected from the weather. All piping and equipment openings shall be temporarily closed during construction to prevent obstruction and damage.
- B. All equipment with damaged finished surfaces shall be cleaned and repainted with the same paints as were factory applied.
- C. Clean-Up: Keep the job site free from the accumulation of waste materials and rubbish daily. At completion of the work, remove all rubbish, construction equipment and surplus materials from the site and leave the premises in a clean condition

3.5 OPERATING AND MAINTENANCE MANUALS

- A. This Contractor shall provide four (4) complete sets of operating and maintenance manuals to the Owner prior to the operating instruction period. Maintenance manuals shall be submitted for approval. The receipt of approved maintenance manuals by the Owner shall be a prerequisite to system acceptance. Each manual shall include the following:
 - 1. A complete set of Shop Drawings arranged in accordance with their appearance in the Specifications. Drawings shall be folded and included in envelopes and bound into the manual.
 - 2. A complete set of operational and servicing instructions for each piece of equipment, bound into the manual adjacent to the corresponding Shop Drawing.
 - 3. A complete listing of all equipment suppliers, together with local agent's names, addresses and telephone numbers.
 - 4. A complete set of valve listings.
 - 5. Copies of all service contracts provided for the guarantee period.
 - 6. Copies of all equipment and system warranties.

3.6 OPERATING INSTRUCTIONS

- A. This Contractor shall provide competent representatives of his firm and also qualified representatives for his major equipment to instruct Owner-designated personnel on the start-up, operation, shut-down and servicing of all equipment and systems furnished and installed under this Section. No less than ten (10) days' notice shall be given to the Owner for the beginning of the instruction period to permit scheduling of Owner personnel. The instruction period shall be a prerequisite to system acceptance. This contractor shall coordinate this requirement with the Commissioning Agent. Refer to specification section 019100 for additional requirements.
- B. Training of the Tenant's and Building Owner's operation and maintenance personnel is required in cooperation with the Tenant's and Building Owner's representatives. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Tenant's and Building Owner's Representatives after submission and approval of formal training plans. Refer to Commissioning Specifications, Section 019100 for contractor training requirements.
- C. At the conclusion of the operating instructions, this Contractor shall have the Owner's personnel sign-off stating they have received the required instruction. Separate

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

statements shall be required for each piece of equipment and system. These statements shall include date, names of Owner's representative, name of instructor, and brief description of equipment or system.

3.7 SYSTEM START-UP AND OPERATION

- A. This Contractor shall provide all labor and materials and services necessary for the initial start-up and operation of all systems and equipment furnished and installed under this Section of the Specifications.
- B. This Contractor shall provide the services of qualified factory representatives for all major equipment pre-start set-up, start-up and initial operation. Such periods shall be sufficient to insure proper operation of systems and equipment.
- C. This Contractor shall check all equipment during the initial start-up to insure correct rotation, proper lubrication, adequate fluid flows, non-overloading electrical characteristics, proper alignment and minimal vibration. Systems shall be checked for air and/or steam and/or water flows throughout without blockages. Rooftop air handling units shall be checked for proper damper connections and positions aligned and adjusted belt drives, proper lubrication, temporary air filters installed, non-excessive electrical characteristics and minimal vibration. Miscellaneous equipment shall be started and operated as described above, as applicable. This Contractor shall prepare and submit monthly start-up and status reports for all equipment and systems as indicated on the schedules. Initial form of this report shall be submitted for review with the initial submittals. Upon closing in of the structure or upon first equipment start-up, the report filing shall be started. One copy of this report shall be submitted to the Testing and Balancing Contractor for his record purposes. Submittal of these reports is a prerequisite for processing and evaluating requisitions.
 - 1. Contractors' tests shall be scheduled and documented in accordance with the commissioning requirements. Refer to Commissioning Specifications, Section 019100 for additional requirements.
 - 2. System verification testing is part of the commissioning process. Verification testing shall be performed by the contractor and witnessed and documented by the Commissioning Agent. Refer to Commissioning Specification Section 019100 for system verification tests and commissioning requirements.
- D. During operation of systems, qualified licensed personnel shall be provided and designated for maintenance of the equipment and systems in good running order. Items such as strainer cleanout, bearing lubrication, packing replacement and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of this Contractor, and continued failures shall be grounds for the Owner to provide such services with back-charges to this Contractor.
- E. Prior to building flush out, all filters installed within all air handling equipment shall be replaced with filters having minimum rating of MERV 13 unless such equipment was specified with filters having a higher rating. Air handling equipment shall include but not be limited to air handling units, rooftop units, energy recovery units, make-up air units, fancoil units and classroom unit ventilators. Upon completion of building flush out, all filters installed within all air handling equipment shall be replaced with filters having minimum rating of MERV 13 unless such equipment was specified with filters having a higher rating.
- F. Coordinate all start-up, operation, and testing activities with the Project Manager, General Contractor and the Commissioning Agent per specification section 019110.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

3.8 SYSTEMS IDENTIFICATION

A. General:

1. All equipment, ductwork and piping furnished under this Section shall be marked for ease of identification in accordance with ANSI A13.1-1981 Standard or as indicated below by this Contractor.
2. Marking shall be done using painted stenciling applied to clean, smooth surfaces.
3. Lettering type and size shall be in accordance with paragraph 3.4 and Table 3 of ANSI Standard, with sharply contrasted background for ease of identification. Duct labeling shall not be less than 3 inches in height. Colors shall be in accordance with paragraph 3.2 and Table 2 of the ANSI Standard.

B. Equipment:

1. Equipment markings shall be prominently painted on each normally visible side of equipment. Equipment intended for installation in finished areas shall have markings located behind normally used access panels mounted so as to be readily found.
2. Equipment identification designations shall be taken from equipment schedules as indicated on the Drawings.
3. All rooftop air handling units, energy recovery units and make-up air units shall be numbered on at least two (2) sides in 4" to 6" letters of contrasting color. Number shall be associated with the street or occupancy address preceding the HVAC unit number (example, 23-1). LED or keyed remote test switch shall be labeled with device number information corresponding to rooftop designation. Where rooftop units with duct smoke detectors are above a suspended ceiling, the tile grid shall be marked with a red dot if an LED is not present.

C. Piping:

1. Piping marking, except as noted below, shall be prominently painted on all piping concealed and exposed to view, at entries to shafts and at all valving. Marking spacing shall be every 20 feet and at all changes in direction.
2. Piping markings shall indicate direction of flow with piping designation taken from piping legend indicated on Drawings.
3. In lieu of painting pipe marking for outside diameters of no less than 3/4 inches but less than 6 inches labeling shall be on semi-rigid plastic which shall be wrapped entirely around the item being identified and attached to itself to form a non-removable band.
4. In lieu of painting pipe marking for outside diameters of 6 inches or greater, springs or metal bands secured to the corners at each end of the semi-rigid plastic marker so as to hold each end of the marker firmly against the pipe may be utilized.
5. In lieu of painting, for outside diameters less than 3/4 inches, labeling of 1/2 inch high lettering on 1-1/2 inch minimum diameter tags shall be attached so as direction of flow arrows will indicate proper flow direction when tag is being read.

D. Ductwork:

1. Ductwork marking shall be prominently painted on all ductwork concealed and exposed to view. Marking spacing shall be every 20 feet at all dampers and at all changes in direction.
2. Ductwork marking shall indicate direction of air flow with ductwork designation to consist of the equipment designation to which it is connected and indicate either high or low velocity system.
3. Access doors at service openings for fire dampers, smoke dampers and smoke detectors shall be identified with letters no less than 1/2 inch in height to indicate the location of the fire protection device(s) within.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- E. Valve Tags:
1. Valve tags shall be 1-1/2 inch diameter brass with 1/4 inch high lettering for service designation over 1/2 inch high valve number designation and shall be provided for all valving.
 2. Two (2) sets of valve lists shall be prepared showing tag numbers, valve locations and valve service. Valve tag numbers shall be marked on Record Drawings. One valve list shall be prepared based on sequenced room numbers of valve locations; one valve list shall be prepared based on valve numbers. One set of lists shall be framed under glass and duplicate list laminated between plastic sheets.
 3. One (1) additional copy shall be framed under glass and mounted on the wall in location as designated by the Architect.

3.9 SHEET METAL WORK REQUIREMENTS

- A. Furnish and install all sheet metal work as herein specified for all air handling systems shown on drawings and/or described in the specifications.
- B. All sheet metal work shall be done in a neat and workmanlike manner with ductwork following building lines and in straight lines with smooth transitions and offsets to suit actual installation. Sheet metal work which does not conform to drawings and/or specifications or is poorly done shall be repaired and/or replaced as described by the Architect.
- C. Reference shall be made to the paragraph covering Coordination Drawings for the responsibility in the preparation of same.
- D. Sheet Metal Contractor shall include in his work furnishing and installing volume dampers in accordance with SMACNA requirements; additional dampers in the duct system for the purpose of balancing by the Balancing Contractor, as well as dampers shown on the drawings.
- E. Sheet Metal Contractor include in his work furnishing and installing automatic control, fire, smoke and combination fire/smoke dampers.
- F. Air handling systems shall conform to the following:
1. All sheet metal work required for ductwork casing and plenums of all low pressure air handling systems shall be galvanized steel and shall conform to requirements of sheet metal work. Exceptions to this requirement shall be as specifically listed below or as indicated on the drawings.
 2. All sheet metal work required for ductwork, casings and plenums of air handling system with scheduled total static pressure equal to or greater than 3 inches shall conform to the requirements for the static pressure scheduled. This construction shall apply from the outside air and return air dampers at the unit inlet and extend to the system terminal boxes.
- G. All casings and plenums shall be provided with 54 inch high, 20 inch wide access doors, except where larger door is required for equipment replacement, or when casing or plenum will not accommodate this size door. When alternate door of larger size is required, it shall be sized to meet requirements of equipment being served. For doors smaller than 54" x 20" the largest following door size which can be accommodated shall be provided: 48" x 20"; 36" x 18"; 24" x 18"; 18" x 18"; 18" x 12"; or 12" x 22". In all cases the bottom of the door opening shall be a minimum of 6 inches above the plenum's bottom.
- H. Sealants: All seams in sheet metal work shall be permanently sealed airtight by the use

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

of appropriate mastic compounds. Joints between dissimilar materials shall be provided with lead gaskets. Louver plenums shall be provided with lead gaskets. Louver plenums shall have all bottom seams and side seams up to distance of 12 inches sealed using solder.

- I. Duct Liners: Where ducts indicated on drawings or specified are to be lined, such lining shall conform to the requirements specified under Acoustic Liner indicated in Paragraph "Sheet Metal Work". Duct sizes indicated on the drawings are nominal internal dimensions and therefore shall be increased accordingly to accommodate duct lining.
- J. The Sheet Metal Contractor shall install all duct mounted smoke detectors, heat detectors and other devices furnished by the Electrical Contractor for mounting in the ductwork or air handling equipment.
- K. All prefabricated duct sections shall be cleaned prior to storage on the site and be provided with protective covering on all openings to maintain the interior of the ductwork clean and free of dust and other materials prior to installation. Field assembled duct sections shall be cleaned during assembly and similarly protected until installation.
- L. Blank off all portions of louvered openings not required for ventilation systems.
- M. Testing for ductwork shall be performed for all duct systems specified to be constructed to a static pressure class of 4" w.g. or greater and to all stainless steel exhaust systems serving laboratory hoods or other systems designed to convey hazardous fumes or materials. The leakage class shall be in accordance with Table 4-1 of SMACNA HVAC Air Duct Leakage Test Manual, First Edition 1985.
- R. The Sheet Metal Contractor shall install automatic control dampers furnished by the Automatic Temperature Control System manufacturer and shall include all safing and/or duct transitions to complete damper installation.

3.10 PIPING SYSTEM INSTALLATION

- A. Installation of Pipe, Fittings and Valves:
 - 1. Furnish and install piping approximately as indicated; straight, plumb and as direct as possible; form right angles on parallel lines with building walls.
 - 2. Keep pipes close to walls, partitions and ceilings; offset only where necessary to follow walls, as indicated.
 - 3. Locate groups of pipes parallel to each other; space them at distances to permit applying full insulation and to permit access for servicing valves.
 - 4. Piping shall be accurately cut to measurements established in the field and worked into place without springing or forcing. All piping shall be assembled using standard manufacturer's screwed or welded fittings. Where standard fittings are not available for branch connections, use "Threadolets" or "Weldolets" as appropriate to suit pipe sizes, neatly cut and welded into the line.
 - 5. All piping shall be reamed to be free of burrs.
 - 6. Keep pipe free from scale and dirt; protect open pipe ends whenever work is suspended during construction to prevent foreign bodies entering and lodging there. Use temporary plug or other approved material for protection.
 - 7. Use all long radius ells on welded piping.
 - 8. Provide bypass line with globe valve with isolation valves to provide bypass around all control valves which serve air handler coils and other central system equipment. Bypass valves are not required for terminal units, radiation, fancoils, cabinet heaters, unit heaters and similar equipment served from a central system. Bypass valve size shall be a minimum of one-half the supply line size.
 - 9. Prior to installation of any piping, submit shop drawings indicating location of all pipes larger than 2 inches in diameter. Piping may be shown on Coordination

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- Drawings in lieu of shop drawings.
10. Provide cap and chain for 3/4 inch hose connection for all drain valves.
- D. Installation of Unions:
1. Provide unions, screwed or flanged, in the following locations:
 - a. In long runs of piping to permit convenient disassembly for alterations or repairs. Provide unions in all trench piping located every 20 feet and at all connections in branch and mains leaving the trench.
 - b. In bypass around equipment.
 - c. In connections to traps, tanks, pumps, and other equipment.
- E. Installation of Valves:
1. Provide shut-off valves where indicated and in the following locations:
 - a. Risers and main branches at points of take-off from their supply or return mains. Valves shall be arranged so that piping mains for the building and for each floor can remain in service while branch line piping is out of service. Balancing valves suitable for shut-off service shall be used in returned piping.
 - b. Individual equipment, control valves, strainers, traps and other piping systems devices at inlet and outlet to permit unit removal for repairs without interfering with remainder of system.
 2. Locate valves for easy access and operation.
 3. Do not locate valves with stems below horizontal.
 4. Provide balancing valve at outlet of each equipment connection. In water piping systems, locate balancing valve as shown on drawings where piping details are provided.
- F. Pipe Welding: Welding backing rings shall be used at each pipe weld. All pipe welders shall be tested and qualified under the National Certified Pipe Welders Bureau. Welders for high pressure steam shall be certified for ASME Code welding.
- H. Drains: All coiling coils shall have drip pans, trapped and condensation discharge piped to nearest suitable receptor except as noted otherwise. All traps shall be located inside to prevent freezing. Trap seals shall be appropriate for respective units scheduled pressure differential plus 50 percent on coils downstream of fans, and a minimum 3 inches for coils upstream of fans.
- I. Gas Piping: This Contractor shall provide for piping all vent lines to outdoors for the specific type of pressure reducing valves or other gas train devices requiring venting to outdoors under the Gas Codes.

3.13 INSULATION APPLICATION REQUIREMENTS

- A. Insulation materials shall be installed in accordance with the applicable insulation classes for piping, ductwork and equipment.
- B. Insulation shall be applied in a workmanlike manner so as to provide a neat and smooth surface, suitable for painting. Work and/or material that is poorly done or done in a manner not conforming to the specifications and/or drawings shall be repaired or replaced as directed by the Architect.
- C. Insulation shall not be applied to piping and related equipment until the completion of pressure testing. Insulation shall not be applied to ductwork and related equipment until air systems have been sealed and/or pressure tested.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- D. Sections of piping and equipment may be covered as the work progresses, provided the above requirements have been met for pressure testing and tightness.
- E. All piping and equipment to be covered shall be clean and dry prior to the application of insulation.
- F. Insulation shall not be applied when ambient temperatures within the space are below 40 degrees F.
- G. Piping and duct insulation shall be carried full thickness through all floor and wall openings, except when installed through sleeves through fire-rated construction, insulation shall be discontinued at the penetration and replaced with caulking material specified for sleeves.
- H. All insulation shall be applied with edges tightly butted.
- I. All voids and/or seams in insulation shall be filled with insulating cement plaster or insulating cement.
- J. All insulation ends shall be finished to a 45 degree level with insulation cement troweled to a neat and smooth finish.
- K. Equipment nameplates, pressure vessel code labels and equipment access doors shall be left exposed with insulation edges finished as described in Paragraph J. above.
- L. Piping installed outdoors with the exception of underground conduit and condenser water piping shall be furnished with layers of insulation of equal thicknesses with the total thickness twice that specified in insulation thickness schedule. The double layer insulation shall be installed so that all seams are staggered. Apply 45 pound roofing felt with 2 inch overlap at joints. All joints to be sealed with asphalt. Wire jacket in place with 16 gauge copper annealed wire on 9 inch centers.
- M. Under no circumstances shall pneumatic control tubing be covered with insulation.
- N. When installation thickness specified exceeds that provided as manufacturer's standard, then multiple layered material shall be used to achieve specified thickness.
- O. Any piping, ductwork or equipment which may convey a fluid gas or air below 75 degrees F. at any time in its normal operation shall be provided with insulation with an external vapor barrier except where explicitly indicated otherwise.
- P. Where specified under Pipe Hangers, Supports and Hangers, insulated chilled water, cold make-up water or refrigerant suction lines shall have calcium silicate used at all points of support. Calcium silicate sections shall be of the same thickness as the adjacent insulation with vapor barriers continued unbroken through the support section. Support sections shall be three times the pipe diameter in length or not less than 12 inches nor more than 24 inches. 14 gauge galvanized sheet metal saddles the same length and diameter as the calcium silicate section and covering not less than 120 degrees of arc shall be provided at support points.
- Q. Insulated hot water lines shall be provided with welded pipe saddles at all support points. Saddles shall fit the insulation outside diameter with insulation filling the void between pipe and saddle.
- R. All chilled water, cold make-up water or other piping insulation with vapor barriers shall not be stapled. Sections of insulation which are stapled shall be removed and replaced with new material as specified.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- S. Insulation for piping and equipment shall be provided with wire or band supports to prevent sagging and cracking of finished surface or vapor barrier. Supports shall be applied in accordance with insulation manufacturer's recommendations. Supports shall generally be located beneath finish jacketing.
- T. Valves which are specified to be insulated shall be covered to top of bonnets.
- U. Insulation for piping systems shall be provided up to coil connections and the exterior casing, including tube returns or manifolds external to casing shall also be insulated except where noted otherwise.
- V. Engine exhaust pipes, fittings, and silencers shall be covered with 4 inch calcium silicate insulation. Insulation shall be applied in two (2) layers with staggered joints. Secure insulation in place with heavy gauge stainless steel bands. Seal all seams and joints in each layer with high temperature cement. Cover insulation with reinforced glass fiber cloth.
- W. All unlined supply and return ductwork located outdoors shall have a minimum thickness of 2 inches of rigid board insulation and an aluminum weatherproof cover applied over the vapor barrier.

3.14 SYSTEM BALANCING

- A. This Contractor, as part of his contract, shall obtain the services of a testing and balancing agency that specializes in this type of work, to perform the work required under this section.
 - 1. The testing and balancing agency selected shall not have installed, fabricated or engineered any part of the system that the testing and balancing work shall be performed on, so as to prevent any conflict of interest. This shall include but not be limited to drilling and patching holes, taking apart and re-assembling equipment, removing and replacing fan guards, removing and replacing control box covers, and changing belts and sheaves.
 - 2. In addition, the selected company shall not be a subsidiary of or be associated with persons having financial interests in the accessories, ductwork, and controls, undergoing these tests so that the Owner will receive a completely unbiased test and balance report upon completion of the work.
 - 3. Additionally, the testing and balancing agency shall complete no work on the HVAC systems, where such work involves the installation or modification to the HVAC systems. Such work is solely assigned to the HVAC sub-contractor and their employees. Note that it is the intention of the paragraphs herein to assign full responsibility for labor, tools, corrections, installation of balancing dampers, installation or test openings, pullet changes, belt changes, and all other "work", which involves modifications or corrections to the HVAC system to HVAC sub-contractor. Where the testing and balancing agent is assigned "work" herein, such work shall be limited to testing, reporting, and providing sufficient information to the HVAC sub-contractor such that they can make necessary modifications or corrections for proper system operation.
- B. The selected testing and balancing agency shall be a certified member of the AABC or the NEBB. Minimum criteria for this project shall be the General Membership Standards of the Associated Air Balance Council, as published nationally in AABC NSFMI Volume One, #81266 or as otherwise noted herein.
- C. All work performed by the approved agency shall be done in full accordance with minimum standards as set forth in AABC National Standards, Fourth Edition (1982) and ASHRAE Systems Manual (1984). In addition, vibration readings shall be taken on all

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

rotating equipment in this section and recorded in mills of deflection.

- D. Submittals:
1. The TAB Agency shall submit a company resume listing personnel and project experience in air and hydronic system balancing and a copy of the agency's Test and Balance Engineer (TBE) certificate.
 2. The TAB Agency shall submit the TAB procedures and agenda proposed to be used.
 3. The TAB Agency shall submit sample forms, which shall include the minimum data required by the AABC National Standards.
- E. This Contractor shall cooperate with the test and balance agency in the following manner:
1. Provide sufficient time before final acceptance data so that tests and balancing can be accomplished and reviewed.
 2. Provide immediate labor and tools to make corrections when required without undue delay. Install balancing dampers where required by the test and balance agency.
 3. Put all heating, ventilating and air conditioning systems and equipment into full operation and shall continue the operation of same during each working day of testing and balancing.
 4. The testing and balancing agency shall be kept informed of any major changes made to the system during construction, and shall be provided with four (4) complete sets of Construction and Coordination drawings, one (1) set of which shall be turned over to the Owner with ductwork systems differentiated by coloring each system's ductwork in a distinguishing color and diffusers, registers and grilles identified with a number corresponding with the respective item on the balancing report.
 5. Include the costs of test openings, dampers, pulley and belt changes in his contract.
- F. The test and balance agency shall test and balance all air handling systems and equipment and shall also test and balance all hot water and make-up water systems. All systems shall be adjusted so that they achieve within 10 percent of design quantities, except over-all pressure relationship shall be maintained.
1. Where provided, air flow measuring devices shall be utilized to balance air system. Accuracy also shall be verified by the balancing agency.
 2. Final adjustments to each variable volume and constant volume box shall be provided by the balancing agency.
 3. Where combination balancing valve and flow measuring devices, or flow devices, are indicated, the balancing agency shall utilize them for balancing the water system.
- G. The items requiring testing, adjusting and balancing include the following:
1. Air Systems:
 - a. Supply Fan
 - b. Return/Exhaust Fans
 - c. Zone Ducts
 - d. Coils (Air Temperature)
 2. Hydronic Systems:
 - a. Coils
- H. TAB Preparation and Coordination:
1. Shop drawings, submittal data, up-to-date revisions, change orders, and other data required for planning, preparation, and execution of the TAB work shall be provided to the TAB agency no later than 30 days prior to start of TAB work.
 2. System installation and equipment start-up shall be complete prior to the TAB

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- agency's being notified to begin.
3. The building control system shall be complete and operational. The Building Control System Contractor shall install all necessary computers and computer programs, and make these operational. Assistance shall be provided for reprogramming, coordination, and problem resolution.
 4. All test points, balancing devices, and identification tags shall be accessible and clear of insulation and other obstructions that would impede TAB procedures.
 5. Qualified installation or start-up personnel shall be readily available for the operation and adjustment of the systems. Assistance shall be provided for coordination and problem resolution.
- I. Reports:
1. The TAB agency shall submit the final TAB report for review by the Engineer. All outlets, devices, and HVAC equipment shall be identified, along with a numbering system corresponding to report unit identification. The TAB agency shall submit an AABC "National Project Performance Guaranty" assuring that the project systems were tested, adjusted and balanced in accordance with the project specifications and AABC National Standards.
 2. Submit four (4) copies of the final TAB Report.
- J. Deficiencies:
1. Any deficiencies in the installation or performance of a system or component observed by the TAB agency shall be brought to the attention of the appropriate responsible person.
 2. The work necessary to correct items on the deficiency listing shall be performed and verified by the affected contractor before the TAB agency returns to retest. Unresolved deficiencies shall be noted in the final report.
 3. System balance reports which, upon field inspection of the systems, are found to be erroneous, shall have the questioned systems corrected by the test and balance agency until a proper balance is achieved. Such correction work shall be done at no cost to the Owner. Balancing Contractor shall field verify balancing settings and measurements as randomly selected by the Architect.
- K. All instruments used for measurements shall be accurate and calibrated. Calibration and maintenance of all instruments shall be in accordance with the requirements of AABC National Standards.
- L. The specified systems shall be reviewed and inspected for conformance to design documents. Testing, adjusting and balancing on each identified system shall be performed. The accuracy of measurements shall be in accordance with AABC National Standards. Adjustment tolerances shall be + or – 10% unless otherwise stated.
1. Equipment settings, including manual damper quadrant positions, manual valve indicators, fan speed control levers, and similar controls and devices shall be marked to show final settings.
 2. All information necessary to complete a proper TAB project and report shall be per AABC Standards unless otherwise noted. The descriptions for work required, as listed in this section, are a guide to the minimum information needed.
- M. Air Systems:
1. The TAB agency shall verify that all ductwork, dampers, grilles, registers and diffusers have been installed per design and set in the full open position. The TAB agency shall perform the following TAB procedures in accordance with the AABC National Standards.
 2. For Supply Fans:
 - a. Test and adjust fan RPM to achieve maximum or design CFM.
 - b. Test and record motor voltage and amperage and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

- c. Perform a Pitot-tube traverse of main supply and return ducts, as applicable to obtain total CFM.
 - d. Test and adjust the outside air on applicable equipment using a pitot-tube traverse. If a traverse is not practical use the mixed air temperature method if the inside and outside temperature difference is at least 20 degrees F. or use the difference between pitot-tube traverses of the supply and return air ducts.
 - e. Test and record system static profile of each supply fan.
 3. For Return/Exhaust Fans:
 - a. Test and adjust fan RPM to achieve maximum or design CFM.
 - b. Test and record motor voltage and amperage, and compare data with the nameplate limits to ensure fan motor is not in or above the service factor.
 - c. Perform a pitot-tube traverse of the main return ducts to obtain total CFM.
 - d. Test and record system static profile of each return fan.
 4. The Balancing Contractor shall make all necessary tests and measurements and provide information to provide for replacement of adjustable sheaves utilized for initial balancing with optimum sized fixed sheave and select optimum replacement sheave sizes for existing equipment fan drives for systems indicated to be modified. All adjustable sheaves replaced shall be tagged to indicate which unit it was on and turned over to the Owner.
 5. For Zone Ducts:
 - a. Adjust ducts to within design CFM requirements. As applicable, at least one zone balancing damper shall be completely open. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
 6. For Coils:
 - a. Once air flows are set to acceptable limits, take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperature shall be taken on the entering and leaving side of each coil.
 7. Where air balancing cannot be completed due to lack of air flow and the reason for the lack of air flow cannot be identified, a static profile shall be performed to identify the reason for loss of adequate air flow.
- N. Hydronic Systems:
1. The TAB agency shall, as applicable, confirm that all hydronic equipment, piping, and coils have been filled and purged; that strainers have been cleaned; and that all balancing valves (except bypass valves) are set full open. The TAB agency shall perform the following testing and balancing functions in accordance with the AABC National Standards.
 - a. Adjust water flow in pipes to achieve maximum or design GPM.
 2. For Coils:
 - a. Test, adjust and balance all chilled water and hot water coils within 10% of design requirements.
 - b. Verify the type, location, final pressure drop and GPM of each coil. This information shall be recorded on coil data sheets.
- O. The TAB agency shall review the project documents and Contractor submittals for their effect on the TAB process and overall performance of the HVAC system. It shall submit recommendations for enhancements or changes to the system within 30 days of document review.
- P. During construction, the TAB agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems.

**OTTOSON MIDDLE SCHOOL
ROOF-TOP UNIT REPLACEMENT
ARLINGTON, MA**

Inspections shall be conducted a minimum of two times. (Typically, these are performed when 60% of the total system is installed and again when 90% of the total system is installed, prior to insulation of the duct and piping.) The TAB agency shall submit a written report of each inspection.

- Q. The Installing Contractor shall isolate and seal sections of ductwork for testing. The test pressures required and the amount of duct to be tested shall be described by the Engineer in the appropriate duct classification section. All testing shall be based on one test per section only unless otherwise noted.
- R. The TAB agency shall be assisted by the Building Control Systems Contractor in verifying the operation and calibration of all HVAC and temperature control systems.
1. Automatic Temperature Control Contractor shall have all automatic valves adjusted and calibrated prior to balancing.
 2. The Balancing Contractor shall make all necessary tests and measurements and provide information by the Automatic Temperature Control Contractor to select the optimum range of sensing and control devices.
 3. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, fire and freezestats, and other safety devices.
 4. Verify that all controlling instruments are calibrated and set for design operating conditions.
- S. To verify system control and operation, a series of three temperature tests shall be taken at approximately two-hour intervals in each separately controlled zone. The resulting temperatures shall not vary more than two degrees F. from the thermostat or control setpoint during the tests. Outside temperature and humidity shall also be recorded during the testing periods.
- T. At the time of final inspection, the TAB agency may be required to recheck, in the presence of the Owner's representative, specific or random selections of data recorded in the certified report. Points and areas for recheck shall be selected by the Owner's representative. Measurements and test procedures shall be the same for the initial work for the certified report. Selections for recheck, specific plus random, will not exceed 10% of the total number tabulated in the report.
- U. The TAB agency shall test and adjust building/zone pressurization by setting the design flows to meet the required flow direction and pressure differential. For positive pressure areas, it shall set the supply air to design flow, and gradually reduce the exhaust air rate to obtain the required flow or pressure difference. For negative pressure areas, it shall set the supply air to design flow, and gradually increase the exhaust air rate to obtain the required flow or pressure difference.
- V. The TAB agency shall test and record life safety control operation on the HVAC equipment. It shall verify the installation of required smoke detectors in air handling equipment (AHE) and shall verify operation of the smoke detector by activating the smoke detector and observing air handler shut-down. With the controls and alarm contractors, the TAB agency shall verify the operation of interconnected systems such as the AHE smoke detector's activation of the fire alarm system and the alarm system's activation of the life safety control sequences.

END OF SECTION