

**6th FLOOR OFFICE RENOVATION
ARLINGTON HIGH SCHOOL**

**Specifications
Issued for Construction**



Turowski2 Architecture, Inc.

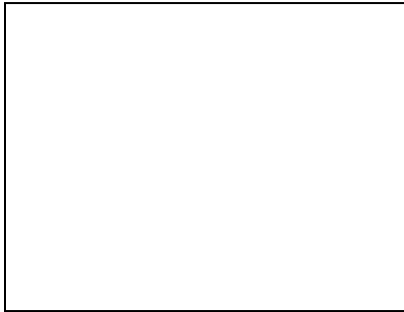
313 Wareham Road
P.O. Box 1290
Marion, MA 02738
Tel.: 508.758.9777
Fax: 508.748-2444
office@t2architecture.com

March 27, 2013

DOCUMENT 00 01 02: STAMP AND SIGNATURE PAGE

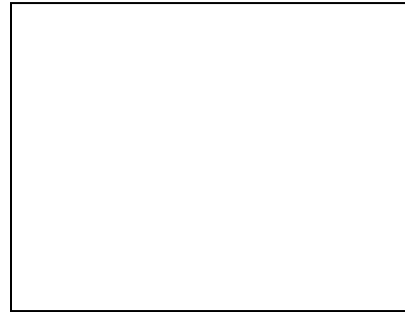
Architect:

Turowski2 Architecture, Inc.
313 Wareham Road
Marion, MA 02738



Structural Engineer:

Engineer's Design Group Inc.
350 Main Street
Malden, MA 02148



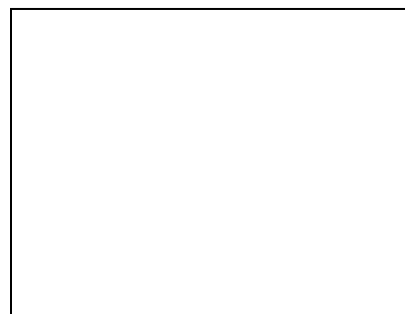
Fire Protection Engineer:

Garcia Galuska & DeSousa, Inc.
370 Faunce Corner Road
Dartmouth, MA 02747



Mechanical Engineer:

Garcia Galuska & DeSousa, Inc.
370 Faunce Corner Road
Dartmouth, MA 02747



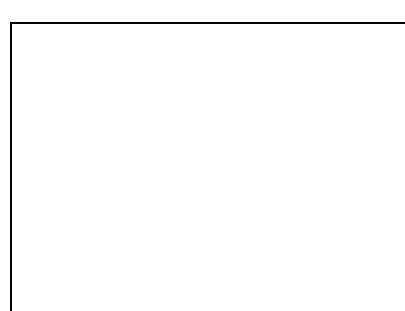
Electrical Engineer:

Garcia Galuska & DeSousa, Inc.
370 Faunce Corner Road
Dartmouth, MA 02747



Hazardous Materials Consultant:

Fuss & O'Neill EnviroScience, LLC
50 Redfield Street, Suite 100
Boston, MA 02122



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PART 1 - GENERAL

BID # 13-04

6th FLOOR OFFICE RENOVATION ARLINGTON HIGH SCHOOL

Sealed bids for the 6th Floor Office Renovation Arlington High School project, 869 Massachusetts Avenue, Arlington, Massachusetts will be received at the Office of the Town Manager/Purchasing Agent attention Domenic R. Lanzillotti, Purchasing Officer, first floor, Town Hall Annex, 730 Massachusetts Avenue, Arlington, Massachusetts 02476 in accordance with bid documents prepared by Turowski2 Architecture Inc, 313 Wareham Road, Marion, MA, 02738.

General Bids due: Friday, April 19, 2013 at 11:00 AM. at that time will be publicly opened and read aloud. All bids must be in sealed envelopes plainly marked, **BID # 13-04 , 6th FLOOR OFFICE RENOVATION ARLINGTON HIGH SCHOOL.**

Filed Sub Bids due: Thursday, April 11, 2013 at 11:00 AM at that time will be publicly opened and read aloud. All bids must be in sealed envelopes plainly marked **BID # 13-04 , 6th FLOOR OFFICE RENOVATION ARLINGTON HIGH SCHOOL**

If mailed, the sealed proposals shall be addressed and mailed to:

Town Managers Office/Purchasing Department
Town Hall Annex
730 Massachusetts Avenue
Arlington, MA 02476

PRE-BID SITE VISIT WILL BE HELD ON Thursday, April 4, 2013 at 3:00 PM AT THE ARLINGTON HIGH SCHOOL, 869 MASSACHUSETTS AVENUE, ARLINGTON, MA. ALL PROSPECTIVE BIDDERS ARE ENCOURAGED TO ATTEND

DCAM CERTIFICATION: GENERAL CONTRACTING

Each General Bidder and each Filed Sub-Bidder shall submit with his bid, a Certificate of prequalification issued by the DCAM, all as required by M.G.L. C.149, s 44A-J inclusive. Applicable sections of MGL Chapter 30, MGL Chapter 674 of the acts of 1981, and "Construction Reform" amendments continued in MGL Chapter 193 of the Acts of 2004.

Plans and Specifications will be available at the Office of The Town Manager/Purchasing Department, Town Hall Annex, 730 Massachusetts Avenue, Arlington, Massachusetts 02476, on or after 12:00 P.M. Wednesday, March 27, 2013 for a refundable deposit of \$50.00 (Cashier's or Treasurer's check only) for each set of Plans and Specifications. Checks shall be made payable to the "Town of Arlington". A mailing fee of \$25.00 (Non-Refundable) by separate check made payable to the "Town of Arlington".

Bid Documents, required forms, specifications and plans can be can be viewed and downloaded on the Town website www.arlingtonma.gov/purchasing.

Every General Bid shall be accompanied by cash or certified check or treasurer's or cashier's check issued by a responsible bank or trust company, or bid bond, all in the amount of 5% of the value of the bid, payable to the "Town of Arlington". No bidder may withdraw his bid for a period of sixty (60) days, Saturdays, Sundays and legal holidays excluded, after the date set for the opening of the General Bids.

The Filed Sub-Bids for this work are:

15500: HVAC

16000: Electrical

Attention is called to the fact that minimum wage rates and health and welfare and pension fund contributions are established for this contract and are a part of the specifications.

Work under this contract shall be governed by MGL Ch.149, Sec.44A-J.

The conditions of employment as set forth in Sections 26 to 27D and 27F of Chapter 149 of the General Laws, as amended, shall prevail in the execution of the work under this contract.

Attached By-Law of the Town of Arlington, Title I, Article 16, concerning Construction Projects which exceed \$200,000.00 is part and parcel of the bid.

Bids to receive consideration must be in the hands of the Purchasing Agent or his authorized representative not later than the day and hour above mentioned. The Awarding Authority reserves the right to waive any informalities and to reject any or all general bids. Performance and labor and materials payment bonds by a company authorized to do business in Massachusetts and satisfactory to the Awarding Authority, each in the amount of 100% of the Contract Price will be required of the successful General Bidder. Upon the return of Plans and Specifications in good condition and within sixty (60) days after the receipt of General Bids, plan deposit will be returned by the Awarding Authority.

Contract Documents are on file for Contractors' inspection at:

Office of the Town Manager/Purchasing Agent, Town of Arlington
Robbins Memorial Town Hall, 730 Massachusetts Avenue, Arlington, MA

END OF DOCUMENT

DOCUMENT 00 21 13: INSTRUCTIONS TO BIDDERS

A. PROPOSAL REQUIREMENTS:

1. Sealed proposals for the 6th Floor Office Renovation Arlington High School project, Arlington, MA will be received at the time and place as stated in the "Invitation to Bid" and in accordance with bid documents prepared by Turowski2 Architecture, Inc.
2. Each General Bid and Filed Sub-Bid proposal, filled out and signed in longhand by the bidder, accompanied by cash, a certified check, or a treasurer's or cashier's check issued by a responsible bank or trust company or a bid bond in the amount of five percent (5%) of the Bid, payable to the "Town of Arlington", must be placed in an envelope, sealed and marked "6th Floor Office Renovation Arlington High School, 869 Massachusetts Avenue, Arlington, MA" and delivered to the Office of the Purchasing Agent (Town Manager), located at the Robbins Memorial Town Hall Annex, Second Floor, 730 Massachusetts Avenue, Arlington, Massachusetts.
3. The following shall be included with each General Bid.
 - a. Form for General Bid
 - b. Bid Bond
 - c. Bid Security Form
 - d. DCAM Certificate of Eligibility and update form
 - e. Certificate of Vote
 - f. Certificate of Non-Collusion
4. All bid deposits of General Bidders, except those of the three lowest responsible and eligible General Bidders, shall be returned within five (5) days, Saturdays, Sundays and legal holidays excluded, after the opening of the general bids. The bid deposits of the three lowest responsible and eligible general bidders shall be returned upon the execution and delivery of the General Contract, or if no award is made, upon the expiration of the time prescribed in the "Invitation". If any general bidder fails to perform his agreement to execute a Contract and furnish a performance bond and also a labor and materials or payment bond as stated in his general bid, his bid deposit shall become and be the property of the Town of Arlington. In case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other unforeseen circumstances affecting the general bidder, his bid deposit shall be returned to him.
5. No claims for immunity or exceptions predicated upon misunderstanding or failure to correctly interpret the above paragraph will be allowed.
6. The Drawings, Specifications and Contract Documents will be available as stipulated in the "Invitation to Bid".

B. BIDDER'S REPRESENTATION:

1. Each General Bidder (hereinafter called "Bidder") by making a bid (hereinafter called "Bid") represents that:

- a. The Bidder has read and understands the Contract Documents and the Bid is made in accordance therewith.
 - b. The Bidder has visited the site and is familiar with the existing site and has familiarized himself with any and all difficulties that may exist.
 - c. The Bidder will assign to this project a full time project superintendent whose qualifications are acceptable to both Owner and Architect.
2. No claim for additional compensation or extension of time will be allowed by the Owner because of lack of Contractor's full knowledge of existing conditions or difficulties attending the execution of this contract.
- C. GENERAL BIDDER'S PREQUALIFICATION:
1. Each General Bidder shall submit with his Bid, a Certificate of Eligibility issued by the Division of Capital Assets and Management (DCAM), showing that the bidder has been approved to bid on projects of the size and type of the named project, and by a Contractor Update Statement (Form CQ3).
 2. It is the bidder's responsibility to obtain the necessary forms from the Division of Capital Assets and Management (DCAM) and make application is sufficient time for DCAM to evaluate the application and issue a Certificate of Eligibility.
 3. The Contractor Update Statement is not a public record as defined in MGL Chapter 4, Section 7 and will not be open to public inspection.
- D. REQUESTS FOR INTERPRETATION:
1. All Bidders shall promptly notify the Architect in writing of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents, the site, and local conditions.
 2. Bidders may contact the Architect by fax at (508) 748-2444 or by email at bitting@t2architecture.com. No interpretations or classifications will be given over the phone.
 3. Bidders requiring clarification or interpretation of the Contract Documents shall make a written request to the Architect. The Architect will answer such requests if received before seven (7) calendar days before the date for receipt of the bids.
 4. Interpretation, correction or change in the Contract Documents will be made by addendum which will become part of the Contract Documents. Neither the Awarding Authority nor the Architect will be held accountable for any oral instructions.
 5. Addendum will be emailed by the Architect to every individual or firm on record as having taken a set of Contract Documents.
 6. Copies of Addendum will be made available for inspection at the locations listed in the Advertisement where Contract Documents are on file.

- E. TAXES:
1. The Awarding Authority is exempt from payment of the Massachusetts Sales Tax. The Contractor will be provided a Certificate of Exemption Number at the pre-construction conference.
- F. WITHDRAWAL OF BIDS:
1. No bidder shall withdraw his Bid for a period of sixty (60) days, Saturdays, Sundays and legal holidays excluded, after the date set for the opening of General Bids.
- G. SUB-CONTRACTS:
1. Work shall be performed by the General Contractor without recourse to Sub-contracts whenever possible.
- H. PERFORMANCE AND PAYMENT BONDS:
1. Performance bond and also labor and materials or payments bond by a company authorized to do business under the laws of the Commonwealth and satisfactory to the Awarding Authority, each equal to 100% of the Contract Price, will be required from the successful Bidder before signing of the Contract. The premium on the bonds shall be included in the Base Bid. Forms of bonds are included by reference and executed copies shall be included in the Contract Documents when the Contract is signed.
- I. TIME FOR CONSTRUCTION/PROJECT SCHEDULE:
1. Construction shall commence upon Contractor's receipt of Notice to Proceed from the Owner.
 2. Substantial completion for 6th Floor Arlington High School Office of the Superintendent shall be according to the following schedule
 - a. Upon Notice to Proceed, the Contractor shall have not more than 107 calendar days to complete the work of the base bid. Awarded alternates are considered part of the base bid.
 - b. Substantial completion
 1. Substantial completion of all work shall be achieved by August 15, 2013.
 2. Final completion of all work shall be achieved by September 3, 2013.
 3. The Contractor shall start the preparatory work under this Contract on written notice from and on date set by the Architect. The Contractor shall start the work at the building at the earliest opportunity and shall continue, without interruption, to completion with all practical dispatch and regularity. Liquidated damages of \$500 per calendar day will be required for each day extending beyond the date of substantial completion for the above mentioned work.
 4. Sequence of work: The contractor shall provide within 30 days a schedule of work showing that the office areas described in the plans shall be ready for occupancy by the administrative staff, by August 15, 2013.
- J. EXAMINE BUILDING:
1. Each bidder is strongly encouraged to visit the site and become completely aware of existing building conditions prior to submitting a bid. There will be a scheduled walk through on

Thursday, April 4, 2013, at 3:00 PM. We will be meeting at the main entrance to the school. We will walk together from the main entrance (Level 3) to the 6th floor. The roof, the attic and pertinent basement areas will be made available for viewing. No other site visits will be allowed, unless scheduled with the Owner.

K. BUILDING PERMIT:

1. All General Bidders are advised that a building permit is required and the cost of same will be waived by the Building Department. The General Contractor shall receive the building permit prior to performing any work on the project.
2. The General Bidder is responsible for any other permits, fees, inspections, etc., as may be required by State and local authorities.

L. GENERAL BID LAWS

1. Commonwealth of Massachusetts General Bid Laws Section 149, Sections 44A through 44H inclusive, and Chapter 30, Sections 39F through 39P inclusive, are incorporated herein by reference. Any inconsistency between the Invitation to Bid, Instruction to Bidders, Bid Forms, Conditions of the Contract, and any other Contract Documents and these statutes, or any other applicable statutes, by-laws, or regulations existing of the date on which the bids are received, shall not be grounds for invalidating the bidding procedures, but where required by law, such statute, by-law, or regulation shall be deemed to govern.

M. WAGE RATES

1. The minimum wage rates and health and welfare fund contributions applicable to this Contract as determined by the Commissioner, Department of Labor and Industries, Commonwealth of Massachusetts under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 and 27d, inclusive as amended shall prevail in the execution of the work under this contract. The State prevailing wages shall be paid under this contract and reported as required.

N. TAXES: The Awarding Authority is exempt from payment of Massachusetts States Tax and United States Tax. A tax exemption number will be provided to the awarded contractor.

O. The Town of Arlington further reserves the right to waive any informalities or to reject any and all bids, or to accept proposals which it deems to be most favorable and in the best interest of the Town.

P. SCHOOLS ACCESS TO CRIMINAL OFFENDER RECORDS

1. The Town of Arlington Schools requires background check according to Chapter 71 Section R38 of Massachusetts General Laws for all contractors and subcontractors working in the schools while school is in session. The Contractor shall provide information needed to perform checks of criminal records of all personnel who will be working at the site and have unmonitored access to children during school operational hours and during hours of afterschool activities.

Q. OWNER OCCUPANCY OF THE PREMISES

1. General: The building is open from 7:30 AM – 8:00 PM Monday through Friday.
2. Spring session, 2013: **Construction activities prior to July 1, 2013 will be limited to field verification of existing conditions.** Arlington High School will be occupied on a regular

basis by students, staff, school administration and custodial staff during the spring session (except vacation days). Any contractor personnel on site during regular school hours shall be subject to CORI checks. The contractor is responsible for coordinating any work during this time with School Administration and for keeping all required entries and exits and corridors clear and safe for building occupants.

3. Summer break 2013: From July 1 - August 31. Regularly programmed school activities will be limited to administrative and custodial functions. The 6th floor will be partially occupied by administrative personnel in offices minimally affected by construction. The contractor is responsible for coordinating all required shut downs with School Administration, and for keeping all required entries and exits and corridors clear and safe for building occupants.
4. Fall Session: Arlington High School will be fully occupied during the regular school session 7:00 AM – 5:00 PM. Regular school sessions begin September 3, 2013. No work shall be undertaken in the school building or on the school grounds while school is in session without minimum two week advance approval by the Superintendent.

END OF DOCUMENT

DOCUMENT 00 31 00: PROJECT INFORMATION

Document 00 31 00 - Project Information:

- Hazardous Materials Report
- Enviro Safe Letter
- Commonwealth of Massachusetts Wage Rates

END OF DOCUMENT

Limited Hazardous Building Materials Inspection

Arlington High School
6th Floor Administrative Offices
869 Massachusetts Ave
Arlington, MA

January 18, 2013 and January 22, 2013

Turowski2 Architecture, Inc.
Marion, Massachusetts

February 1, 2013



Fuss & O'Neill EnviroScience, LLC
50 Redfield Street, Suite 100
Boston, Massachusetts 02122



FUSS & O'NEILL
EnviroScience, LLC

February 1, 2013

Ms. Bonne DeSousa, LEED AP, MCPPO
Project Manager
Turowski2 Architecture, Inc.
313 Wareham Road
P.O. Box 1290
Marion, MA 02738

Re: Limited Hazardous Building Materials Inspection
Arlington High School – 6th Floor AHS Administration Offices
Arlington, Massachusetts
Fuss & O'Neill EnviroScience, LLC No. 20121327.A1E

Dear Ms. DeSousa:

Enclosed is the report for the limited hazardous building materials inspection conducted in response to proposed renovations for the 6th Floor Administration Offices located at the Arlington High School located at 869 Massachusetts Avenue in Arlington, Massachusetts.

The services were performed on January 18, 2013 and January 22, 2013 by Fuss & O'Neill EnviroScience, LLC licensed Inspector(s) and included a limited asbestos inspection, lead-based paint determination, and an inventory of PCB-containing ballasts and mercury-containing lamps. The information summarized in this document is for the above-mentioned materials only. The work was performed in accordance with our written proposal dated September 7, 2012.

If you have any questions regarding the contents of this report, please do not hesitate to contact me at (617) 282-4675, extension 4701. Thank you for this opportunity to have served your environmental needs.

Sincerely,

Robert L. May, Jr.
Vice President

50 Redfield Street
Suite 100
Boston, MA
02122
t (617) 282-4675
f (617) 282-8253

www.FandO.com

Connecticut
Massachusetts
Rhode Island
South Carolina

RLM/ftc
Enclosure

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1 Introduction

On January 18, 2013 and January 22, 2013, Fuss & O'Neill EnviroScience, LLC (EnviroScience) representatives, Jonathan Hand and Luigi Marangiello, performed a limited hazardous building materials inspection in response to proposed renovations for the 6th Floor Administration Offices at Arlington High School located at 869 Massachusetts Ave in Arlington, Massachusetts. The site inspection included a limited asbestos inspection, lead-based paint determination, and an inventory of PCB-containing ballasts and mercury-containing lamps. Refer to *Appendix A* for a copy of the inspectors licenses.

This limited hazardous building materials inspection was performed in response to proposed renovations to occur at the 6th Floor Administration Offices as indicated on the drawings provided by the Architect (dated March 5, 2012). The inspection also included proposed areas of HVAC demolition and installation, and areas that would be impacted by installation of electrical conduit extending from the 6th floor to the basement. The work was performed for Turowski2 Architecture, Inc. in accordance with written scope of services dated September 7, 2012.

2 Asbestos Inspection

A property Owner must ensure that performance of a thorough inspection for asbestos-containing materials (ACM) prior to possible disturbance of materials containing asbestos during renovation or demolition is conducted. This is a requirement of the U.S. Environmental Protection Agency (USEPA) National Emission Standards for Hazardous Air Pollutants (NESHAP) regulation 40 CFR Part 61, Sub-Part M.

This includes Friable, Non-Friable Category I, and Non-Friable Category II ACM.

A Friable Material is defined as material that contains greater than 1 percent asbestos, that when dry can be crumbled, pulverized, or reduced to powder by hand pressure.

A Category I Non-Friable Material refers to material that contains greater than 1 percent asbestos (e.g. packings, gaskets, resilient floor coverings, asphalt roofing products, etc.) that when dry cannot be crumbled, pulverized, or reduced to powder by hand pressure.

A Category II Non-Friable Material refers to any non-friable material (excluding Category I materials) that contains greater than 1 percent asbestos that when dry cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Massachusetts Department of Environmental Protection (MassDEP) further defines the definition of asbestos-containing materials as any material containing 1 percent or more asbestos to be an ACM.

During this inspection, suspect asbestos-containing materials (ACM) were separated into three USEPA categories. These categories are Thermal System Insulation (TSI), Surfacing (SURF), and Miscellaneous (MISC). TSI includes all materials used to prevent heat loss/gain or water condensation on mechanical systems. Examples of TSI are pipe insulation, boiler insulation, duct insulation, and mudded insulation on pipe fittings. Surfacing ACM includes all ACM that is sprayed, troweled, or otherwise applied to an existing surface. Surfacing ACM is commonly used for fireproofing, decorative, and acoustical

applications. Miscellaneous materials include all ACM not listed as thermal or surfacing, such as linoleum, vinyl asbestos flooring, and ceiling tiles.

Samples are recommended to be collected in a manner sufficient to determine asbestos content and include homogenous building materials. The USEPA NESHAP regulation does not specifically identify a minimum number of samples to be collected, but recommends the use of sampling protocols included in 40 CFR Part 763, Sub-Part E – Asbestos Containing Materials in Schools.

Samples of suspect asbestos-containing materials were collected in accordance with United States Environmental Protection Agency (USEPA) recommendations and Asbestos Hazard Emergency Response Act (AHERA) protocols. The protocols included the following:

Surfacing Materials (SURF) (e.g. plaster, spray-on fireproofing, etc.) were collected in a randomly distributed manner representing each homogenous area based on the overall quantity represented by the sampling as follows:

- Three (3) samples collected from each homogenous area that is less than or equal to 1,000 square feet.
- Five (5) samples collected from each homogenous area that is greater than 1,000 square feet, but less than or equal to 5,000 square feet.
- Seven (7) samples collected from each homogenous area that is greater than 5,000 square feet.

Thermal System Insulation (TSI) (e.g. pipe insulation, tank insulation, etc.) was collected in a randomly distributed manner representing each homogenous area. Three (3) bulk samples were collected from each material and sent to laboratory for asbestos analysis. Also, a minimum of one (1) sample of any patching material (less than 6 linear of square feet) applied to TSI was collected.

Miscellaneous Materials (MISC) (e.g. floor tile, gaskets, construction mastics, etc.) had a minimum of two (2) samples collected as representative of each homogenous material type. Sampling was conducted in a manner sufficient to determine asbestos content of the homogenous material as determined by the Asbestos Inspector(s). If materials identified were of (significant) minimal quantity, only a single sample was collected.

The Asbestos Inspector(s) collected samples, and prepared proper chain of custody for transmission of samples to an accredited laboratory for analysis by Polarized Light Microscopy (PLM). Samples of all suspect ACMs to be impacted by the renovations were collected. The sampling locations, material type, sample identification, and asbestos content are identified by bulk sample analysis in Tables 1 and 2 of the “Results” section. Any materials at the site not listed in the following tables should be considered suspect ACM until sample results prove otherwise. Refer to Appendix B for asbestos sample results.

2.1 Results

Utilizing the USEPA protocol and criteria, the following materials were determined to be **ACM**:

TABLE 1
Asbestos Containing Materials

Sample Location	Material Type	Sample #	Asbestos Content
Roof	Black Sealant on Air Handling Unit	0118JH-07A	10% Chrysotile
Room 606A	Brown Floor Tile underneath Plywood Underlayment	122JH-02A	5% Chrysotile
Room 606A	Black Felt Mastic Associated with Brown Floor Tile underneath Plywood Underlayment*	122JH-03A	0.94% Chrysotile (Assumed Positive)
6 th Floor Corridor	12x12 Black/Brown Mottled Floor Tile and Black Mastic	N/A	Assumed Positive
6 th Floor Rooms	12x12 White Floor Tile and Black Mastic	N/A	Assumed Positive
Roof	Roofing Layers and Curbing Associated with HVAC Unit (Assumed)	Recommend Sampling	Assumed Positive

*These samples were recommended for TEM analysis and results confirmed presence of asbestos above 1%.

Utilizing the USEPA protocol and criteria, the following materials were determined not to contain asbestos.

TABLE 2
Non-Asbestos Containing Materials

Sample Locations	Material Type	Sample #
Corridor Outside Room 609, Room 603, and Corridor Ceiling	Drywall	0118JH-01 A-C
Corridor Outside Room 609, Room 605A, and Corridor Ceiling	Joint Compound	0118JH-02 A-C
Room 606A, Room 607, and Room 610	Plaster Skim Coat	0118JH-03 A-C
Room 606A, Room 607, and Room 610	Plaster Rough Coat	0118JH-04 A-C

Sample Locations	Material Type	Sample #
Room 606A and Room 610	4" White Vinyl Baseboard*	0118JH-05 A-B
Room 606A and Room 610	Brown Mastic Associated with 4" White Vinyl Baseboard*	0118JH-06 A-B
Room 606A and Room 610	Carpet Glue*	0118JH-08 A-B
Roof	White Sealant on Air Handling Unit*	0118JH-09 A-B
Room 606A	Grey Leveling Compound underneath Plywood Underlayment	122JH-01 A-B
6 th Floor Corridor	Plaster Ceiling Skim Coat	122JH-04 A-B
6 th Floor Corridor	Plaster Ceiling Rough Coat	122JH-05 A-B
Basement and 5 th Floor	Joint Compound Associated with Ceiling	122JH-06 A-B
Basement and 5 th Floor	Drywall Associated with Ceiling	122JH-07 A-B
5 th Floor	Skim Coat on Support Beam	122JH-08

*Material type confirmed as non-asbestos by additional TEM analysis

Refer to *Appendix B* for Laboratory Analysis Results.

2.2 Discussion

The USEPA, Occupational Safety and Health Administration (OSHA), and the Commonwealth of Massachusetts Department of Labor Standards (DLS), formerly known as the Division of Occupational Safety (DOS), defines any material that contains greater than one percent (>1%) asbestos, utilizing PLM, as being an ACM. The Commonwealth of Massachusetts Department of Environmental Protection (MassDEP) defines any material that contains equal to or greater than one percent ($\geq 1\%$) asbestos as being an ACM. Materials that are identified as "none detected" are specified as not containing asbestos.

The USEPA has suggested that materials that are non-friable organically bound materials (e.g. mastic adhesives, etc.) are recommended for further confirmatory analysis utilizing Transmission Electron Microscopy (TEM). Five of the collected samples were analyzed by TEM, and the results of TEM analysis are provided below in Table 3.

TABLE 3
Materials Analyzed By TEM

Sample Location	Material Type	Sample #	Asbestos Content
Room 606A	4" White Vinyl Baseboard	0118JH-05A	None Detected
Room 610	Brown Mastic Associated with 4" White Vinyl Baseboard	0118JH-06A	None Detected
Room 610	Carpet Glue	0118JH-08A	<0.25% Chrysotile
Roof	White Sealant on Air Handling Unit	0118JH-09A	None Detected
Room 606A	Black Felt Mastic Associated with Brown Floor Tile underneath Plywood	122JH-03A	0.94% Chrysotile (Assumed Positive)

The results of confirmatory analysis by TEM did not identify asbestos at 1% or greater for any of the five analyzed materials. However, due to the concentration of asbestos in the black felt mastic, EnviroScience suggests removal of this material as an asbestos-containing material; this shall be performed by a licensed Asbestos Abatement Contractor. The materials have been included in Table 1 or Table 2 (above) based on confirmatory analysis results. In addition, those materials containing asbestos have also been included in the following Table 4, and cost estimate. Refer to *Appendix C* for TEM analysis results.

The top layer of floor tile is assumed positive due to original architectural specifications requiring vinyl asbestos tile to be used in construction. The Architect also provided (previous) results of bulk sample analysis, which identified representative floor tile and mastic as asbestos-containing materials. Note that prior results did not constitute an asbestos inspection in accordance with NESHAP regulations. Furthermore, confirmatory sampling of floor tile and mastic was not completed per request of the Architect.

Concealed roofing was not sampled at the time of this inspection per request of the Architect. Sampling shall be performed at a later date (i.e. during construction phase) in order to prevent extended use of temporary roof patching. Concealed flooring is also assumed underneath interior partition walls within the scope of renovation work.

Table 4 identifies the location, material type, and quantity of ACM identified during this inspection. Any suspect material not identified in this inspection should be presumed to contain asbestos until sample results prove otherwise.

TABLE 4
Materials Present Containing Asbestos

Location	Material Type	Estimated Quantity
Roof	Black Sealant on Air Handling Unit	100 LF
Roof	Roofing Layers and Curbing Associated with HVAC Unit (Assumed Positive)	250 SF
6 th Floor	Multi-Layered Floor Tile and Associated Mastics (Note: Concealed floor tile is underneath interior partition walls scheduled for removal)	Base Bid = 5,900 SF (Includes School Committee Room) Alternate Bid = 1,375 SF (Business/Purchasing Offices)
Basement through 6 th Floor	Multi-Layered Floor Tile and Associated Mastic	Electrical Risers = 6 @ 4 SF EA

2.3 Conclusion

The materials determined to contain asbestos that will be impacted by any proposed renovation and/or demolition work must be abated by a licensed Asbestos Abatement Contractor prior to disturbance in building demolition or renovation. This includes both friable and non-friable ACM, and is a

requirement of the Commonwealth of Massachusetts DLS, MassDEP, and USEPA NESHAP standards for asbestos abatement.

EnviroScience recommends that a comprehensive scope of work and technical specification be developed as part of renovation plans for the site. We have provided a cost to develop the specifications for inclusion in the overall renovation plans. We have also developed an opinion of cost for the complete removal of all identified asbestos. Note the total cost is inclusive of removing all asbestos, and a more limited scope can be tailored to any specific renovation work as necessary.

Any suspect material encountered during renovation/demolition that is not identified in this report as being non-ACM should be assumed to be ACM until sample results prove otherwise.

3 Lead-Based Paint Determination

A lead-based paint determination was performed for representative building components by Fuss & O'Neill EnviroScience, LLC (EnviroScience) representative, Jonathan Hand, on January 18, 2013. An X-ray fluorescence (XRF) analyzer was used to perform the lead-based paint determination. The testing was conducted in accordance with the protocol outlined in the attached document: "Testing Procedures and Equipment" (*Appendix D*).

A Radiation Monitoring Device Model LPA-1, serial number 1138, was utilized for the lead-based paint determination. The instrument was checked for proper calibration prior to each use as detailed by the manufacturer and the Performance Characteristic Sheet (PCS) developed for the instruments.

For the purpose of this lead-based paint determination, representative building components were tested as part of this limited inspection. Of course, individual repainting efforts are not discoverable in such a limited program. Lead-based paint issues involving properties that are not residential are regulated to a limited degree for worker protection relating to paint-disturbing work activities and waste disposal.

Worker protection is regulated by OSHA regulations, as well as DLS regulations. These regulations involve air monitoring of workers to determine exposure levels when disturbing lead-containing paint. A lead-based paint determination cannot determine a safe level of lead, but is intended to provide guidance for implementing industry standards for lead in paint at identified locations. Contractors may then better determine exposure of workers to airborne lead by understanding the different concentrations of lead-based paint on representative components and surfaces. Air monitoring can then be performed during activities that disturb paint on representative surfaces.

The USEPA Resource Conservation and Recovery Act (RCRA), as well as MassDEP, regulate disposal of lead-containing waste. Waste materials containing lead that will be impacted during renovation or demolition and result in waste for disposal must be tested using the Toxicity Characteristic Leachate Procedure (TCLP) analysis if lead is determined to be present in non-residential buildings. A TCLP sample is a representative sample of the intended waste stream. The results are compared to a threshold value of 5.0 mg/L; a result exceeding this value is considered hazardous lead waste. If the result is below the established level, the material is not considered hazardous and may be disposed of as normal construction debris.

A level of lead-based paint exceeding 1.0 milligrams of lead per square centimeter (mg/cm²) is considered toxic or dangerous for compliance with residential standards. For purpose of this lead-based paint determination the level of 1.0 mg/cm² has been utilized as a threshold for areas where possible worker exposures may occur. The complete results of the lead-based paint determination are included in *Appendix E*.

3.1 Results

The lead-based paint determination indicated consistent painting trends associated with representative building components that may be impacted by possible renovation work. Few painted components were determined to contain levels of lead (greater than 1.0 mg/cm²) including the following:

TABLE 5
Lead Painted Building Components

Location	Item	Substrate	Reading (mg/cm ²)
Room 603	A Wall	Brick	3.3
Room 606A	Wall	Plaster	1.3
Room 606A	Window Frame	Wood	1.7
Room 605A	Window Frame	Wood	1.2
Room 607	Window Frame	Wood	1.4
Room 609	Window Frame	Wood	1.5
Room 610	Window Frame	Wood	1.2

POS = assumed positive

3.2 Discussion

OSHA published a Lead in Construction Standard (OSHA Lead Standard) 29 CFR 1926.62 in May 1993. The OSHA Lead Standard has no set limit for the content of lead in paint below which the standards do not apply. The OSHA Lead Standards are task-based, and derived from airborne exposure and blood lead levels.

The results of this survey are intended to provide guidance to contractors for occupational exposure-control to lead. Building components containing lead levels above industry standards may cause exposures to lead above OSHA standards during demolition and renovation activities. A TCLP sample to characterize the expected waste that may result from possible selective demolition and/or renovation work was not collected as part of this preliminary feasibility study.

3.3 Conclusion

Contractors must be made aware that OSHA has not established a level of lead in a material below which 29 CFR 1926.62 does not apply. Contractors shall comply with exposure assessment criteria, interim worker protection, and other requirements of the regulation as necessary to protect workers during any renovation work that will impact lead paint.

Lead paint was found on a few building components including the following: exterior plaster walls and wood window frames. The lead screening was carried out as part of this limited inspection, and included areas of proposed renovation work only. Note that any future work involving surface preparation of the identified painted surfaces shall be performed in accordance with OSHA worker protection requirements.

The building is presently characterized as commercial property, which is not subject to the Department of Public Health Child Lead Poisoning Prevention Program (CLPPP) 105 CMR 460.000 regulations. The property may be renovated using procedures required in accordance with OSHA regulation 29 CFR 1926.62 and DLS Regulation 454 CMR 22.11. In addition, the building is not considered a “child occupied facility” and therefore not subject to lead safe renovation requirements of 454 CMR 22.11.

***Disclaimer:** The information contained in the survey report concerning the presence or absence of lead paint does not constitute a comprehensive lead inspection in accordance with Commonwealth of Massachusetts regulations 105 CMR 460. The surfaces tested represent only a portion of those surfaces that would be tested to determine whether the premises are in compliance with the aforementioned regulations, which are specific to a child occupied residence only and not applicable to a building of this type and use.*

4 PCB-Containing Fluorescent Ballasts and Mercury-Containing Lamps

4.1 PCB-Containing Fluorescent Ballasts

Fluorescent light ballasts manufactured prior to 1979 may contain capacitors that contain PCBs. Ballasts installed as late as 1985 may contain PCB capacitors. Fluorescent light ballasts that are not labeled as “No-PCBs” must be assumed to contain PCBs unless proven otherwise by quantitative analytical testing. Capacitors in fluorescent light ballasts labeled as non-PCB containing may contain diethylhexyl phthalate (DEHP). DEHP was the primary substitute to replace PCBs for small capacitors in fluorescent lighting ballasts in use until 1991. DEHP is a toxic substance, a suspected carcinogen, and is listed under RCRA and the Superfund law as a hazardous waste. Therefore, Superfund liability exists for landfilling both PCB and DEHP- containing light ballasts. These listed materials are considered hazardous waste under RCRA, and require special handling and disposal considerations.

On January 18, 2013, EnviroScience representative(s), Jonathan Hand and Luigi Marangiello, performed a visual inspection of representative fluorescent light fixtures to identify possible PCB-containing ballasts. The inspection involved visually inspecting labels on representative light ballasts to identify dates of manufacture and labels indicating “No PCBs”. Ballasts manufactured after 1991 were not listed as PCB or DEHP-containing ballasts, and were not quantified for disposal.

All ballasts without a label indicating “No PCBs” are presumed to be PCB waste and must be segregated for proper removal, packaging, transport, and disposal as PCB waste. All those ballasts marked as “No PCBs” with date labels indicating manufacture prior to 1991 are presumed to contain DEHP. DEHP-containing ballasts must be segregated for proper removal, packaging, transport, and disposal as non-PCB hazardous waste. Note that disposal requirements for DEHP-containing ballasts are slightly varied, and (disposal) costs are slightly less than PCB-containing light ballasts.

Table 6
PCB/DEHP-Containing Ballasts

Type	Quantity
PCB	0
DEHP	72
Total	72

4.2 Mercury-Containing Equipment

Fluorescent lamps are presumed to contain mercury vapor, which is a hazardous substance to both human health and the environment. Thermostatic controls and electrical switch gear may contain a vial or bulb of mercury associated with the control. Mercury-containing equipment is regulated for proper disposal by the USEPA RCRA hazardous waste regulations. According to the USEPA, mercury lamps are characterized as a Universal Waste. Therefore, all fluorescent lamps must be recycled or disposed of as hazardous waste.

On January 18, 2013, EnviroScience representatives, Jonathan Hand and Luigi Marangiello, performed an inventory of mercury lamps, thermometers, and mercury switches. These fixtures were inventoried in-place.

Table 7
Mercury-Containing Equipment

Type	Quantity
1' Bulb	0
2' Bulb	0
4' Bulb	144
8' Bulb	0
CFL	0

We have included a cost estimate for hazardous materials abatement in *Appendix G*.

Report prepared by Senior Environmental Technician, Jonathan Hand.

Reviewed by:



Dustin A. Diedricksen
Project Manager/Senior Scientist



Robert L. May, Jr.
Vice President

Appendix A

Inspector Licenses and Certifications

Commonwealth of Massachusetts
Department of Labor Standards

Heather E. Rowe, Director

Asbestos Inspector



JONATHAN L. HAND

Eff. Date 02/23/12

Exp. Date 03/07/13

A1041945

Member of C.O.N.E.S.

NB

13



NB-RENEWAL



Commonwealth of Massachusetts
Department of Labor Standards

Heather E. Rowe, Director

Asbestos Inspector



LUIGI MARANGIELLO

Eff. Date 01/10/13

Exp. Date 01/10/14

A1900486

Member of C.O.N.E.S.

NBN

14



NB-NEW



Appendix B

Asbestos Sample Results and Chain of Custody

**EMSL Analytical, Inc.**

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order: 131300266

CustomerID: ENVI54

CustomerPO:

ProjectID:

Attn: **Dustin Diedricksen**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
 Fax: (888) 838-1160
 Received: 01/21/13 9:20 AM
 Analysis Date: 1/22/2013
 Collected: 1/18/2013

Project: **20121327.A1E / Arlington High School; AHS Administrative Offices; T2 Architecture**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
0118-JH-01A 131300266-0001	Corridor O/S Room 609 - Drywall	Tan/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
0118-JH-01B 131300266-0002	Room 603 - Drywall	Tan/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
0118-JH-01C 131300266-0003	Corridor Ceiling - Drywall	Tan/White Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
0118-JH-02A 131300266-0004	Corridor O/S Room 609 - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-02B 131300266-0005	Room 605A - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-02C 131300266-0006	Corridor Ceiling - Joint Compound	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-03A 131300266-0007	Room 606A - Skim Coat Plaster Wall	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-03B 131300266-0008	Room 607 - Skim Coat Plaster Wall	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

Kevin Pine (14)

Steve Grise (7)

Renaldo Drakes, Laboratory Manager
or other approved signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Reporting limit is 1%
 Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-10773 and VT AL357102

Initial report from 01/22/2013 15:35:57



EMSL Analytical, Inc.

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order: 131300266

CustomerID: ENVI54

CustomerPO:

ProjectID:

Attn: **Dustin Diedricksen**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
Fax: (888) 838-1160
Received: 01/21/13 9:20 AM
Analysis Date: 1/22/2013
Collected: 1/18/2013

Project: **20121327.A1E / Arlington High School; AHS Administrative Offices; T2 Architecture**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
0118-JH-03C 131300266-0009	Room 610 - Skim Coat Plaster Wall	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-04A 131300266-0010	Room 606A - Rough Coat Plaster Wall	Gray Fibrous Homogeneous	2% Hair	98% Non-fibrous (other)	None Detected
0118-JH-04B 131300266-0011	Room 607 - Rough Coat Plaster Wall	Gray Fibrous Homogeneous	2% Hair	98% Non-fibrous (other)	None Detected
0118-JH-04C 131300266-0012	Room 610 - Rough Coat Plaster Wall	Gray Non-Fibrous Homogeneous	<1% Hair	100% Non-fibrous (other)	None Detected
0118-JH-05A 131300266-0013	Room 606A - 4" White Vinyl Baseboard	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-05B 131300266-0014	Room 610 - 4" White Vinyl Baseboard	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-06A 131300266-0015	Room 606A - Brown Mastic a/w 4" White VBB	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-06B 131300266-0016	Room 610 - Brown Mastic a/w 4" White VBB	Brown Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

Kevin Pine (14)

Steve Grise (7)

Renaldo Drakes, Laboratory Manager
or other approved signatory

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Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-10773 and VT AL357102

Initial report from 01/22/2013 15:35:57

**EMSL Analytical, Inc.**

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

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Attn: **Dustin Diedricksen**
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Phone: (860) 646-2469
 Fax: (888) 838-1160
 Received: 01/21/13 9:20 AM
 Analysis Date: 1/22/2013
 Collected: 1/18/2013

Project: **20121327.A1E / Arlington High School; AHS Administrative Offices; T2 Architecture**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
0118-JH-07A 131300266-0017	Roof - Black Sealant on Air Handling Unit	Black Non-Fibrous Homogeneous		90% Non-fibrous (other)	10% Chrysotile
0118-JH-07B 131300266-0018	Roof - Black Sealant on Air Handling Unit				Stop Positive (Not Analyzed)
0118-JH-08A 131300266-0019	Room 610 - Carpet Glue	Tan Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-08B 131300266-0020	Room 606A - Carpet Glue	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-09A 131300266-0021	Roof - White Sealant on Air Handling Unit	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
0118-JH-09B 131300266-0022	Roof - White Sealant on Air Handling Unit	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

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Steve Grise (7)

Renaldo Drakes, Laboratory Manager
or other approved signatory

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 Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-10773 and VT AL357102

Initial report from 01/22/2013 15:35:57

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FUSS & O'NEILL
EnviroScience, LLC

50 Redfield St, Suite 100, Boston, MA 02122

www.fando.com

(617) 282-4675 Fax (617) 282-8253

SAMPLE LOG FOR ASBESTOS BULKS

Sheet 1 of 2

Project Name: T2 ARCHITECTURE -
Arlington High School - AHS Administrative Offices Project No. 20121327.AIE
Building: Arlington High School Project Manager: A. DIEDRICKSEN

Sample ID	Sample Location	Material	Result (%)
1 0118-JH-01A	Corridor 9's Room 609	DRYWALL	
X 0118-JH-01B	Room 603	↓	
2 0118-JH-01B	Room 603		
3 0118-JH-01C	CORRIDOR CEILING	↓	
4 0118-JH-02A	Corridor 0's Room 609	Joint Compound	
X 0118-JH-02B	Room 605A	↓	
5 0118-JH-02B	Room 605A		
6 0118-JH-02C	Corridor Ceiling	↓	
7 0118-JH-03A	Room 606A	SKIMCOAT PLASTER WALL	
8 0118-JH-03B	Room 607	↓	
9 0118-JH-03C	Room 610		
10 0118-JH-04A	Room 606A	ROUGHCOAT PLASTER WALL	

Analysis Method: PLM Other

Turnaround Time 48 hr per D.D.

Based on the turnaround time indicated above, analyses are due to EnviroScience on or before this date: 1/21/13. Please call the EnviroScience Laboratory if analyses will be late at (860) 646-2469.

Fax Results to the EnviroScience Laboratory at: 860-812-2228.

Special Instruction: STOP COUNT AT FIRST POSITIVE, IN EACH HOMOGENEOUS SET,
NO POINT COUNTING

Samples collected by: JH + LM

Date: 1/18/13 Time: AM

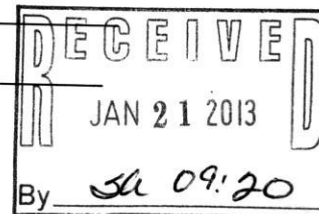
Samples [Rec'd] [Sent by] LM

Date: 1/18/13 Time: PM

Samples Received by: _____ Date: _____ Time: _____

Shipped To: EMSL State MA Other

Method of Shipment: Fed Ex UPS Overnight UPS Ground Other





SAMPLE LOG FOR ASBESTOS BULKS

Sheet 2 of 2

Project Name: T2 ARCHITECTURE - Arlington High School - AHS Administrative Offices Project No. 20121327.A1E
 Building: Arlington High School Project Manager: _____

Sample ID	Sample Location	Material	Result (%)
11 0118-JH-04B	Room 607	Roughcoat PLASTER	
12 0118-JH-04C	Room 610	↓	
13 0118-JH-05A	Room 606A	4" WHITE VINYL BASEBOARD	
14 0118-JH-05B	Room 610	↓	
15 (★) 0118-JH-06A	Room 606A	BROWN MASTIC ASSOCIATED WITH 4"	
16 (★) 0118-JH-06B	Room 610	↓ WHITE VBB	
17 0118-JH-07A	Roof	Black Sealant on and AIR HANDLING	
18 0118-JH-07B	↓	↓	UNIT
19 0118-JH-08A	Room 610	CARPET GLUE	
20 0118-JH-08B	Room 606A	↓	
21 0118-JH-09A	ROOF	↗ ↖	
22 0118-JH-09B	↓	↘ ↙ WHITE SEALANT ON AIR HANDLING UNIT	

Analysis Method: PLM Other

Turnaround Time _____

Based on the turnaround time indicated above, analyses are due to EnviroScience on or before this date: _____. Please call the EnviroScience Laboratory if analyses will be late at (860) 646-2469.

Fax Results to the EnviroScience Laboratory at: 888-838-1160.

Special Instruction: See INSTRUCTIONS on SHEET 1 of 2
 (★) SEPARATE MASTIC FROM VINYL BASEBOARD

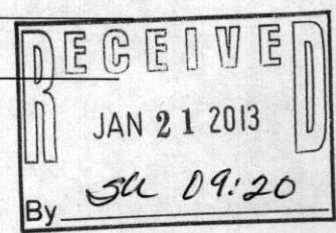
Samples collected by: JH + LM Date: 1/18/13 Time: AM

Samples [Rec'd] [Sent by] [LM] Date: [1/18/13] Time: PM

Samples Received by: _____ Date: _____ Time: _____

Shipped To: EMSL State MA Other _____

Method of Shipment: Fed Ex UPS Overnight UPS Ground Other _____





EMSL Analytical, Inc.

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order: 131300296

CustomerID: ENVI54

CustomerPO:

ProjectID:

Attn: **Bob May**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
Fax: (888) 838-1160
Received: 01/23/13 9:45 AM
Analysis Date: 1/23/2013
Collected: 1/22/2013

Project: **20121327.A1E / Arlington High School**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
122JH-01A 131300296-0001	6th Floor 606A - Grey Leveling Compound under Plywood	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-01B 131300296-0002	6th Floor 606A - Grey Leveling Compound under Plywood	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-02A 131300296-0003	6th Floor 606A - Brown Floor Tile under Plywood & 12x12 Tile	Brown Non-Fibrous Homogeneous		95% Non-fibrous (other)	5% Chrysotile
122JH-02B 131300296-0004	6th Floor 606A - Brown Floor Tile under Plywood & 12x12 Tile				Stop Positive (Not Analyzed)
122JH-03A 131300296-0005	6th Floor 606A - Black Felt Mastic a/w 02	Black Fibrous Homogeneous	70% Cellulose	30% Non-fibrous (other)	None Detected
122JH-03B 131300296-0006	6th Floor 606A - Black Felt Mastic a/w 02	Black Fibrous Homogeneous	70% Cellulose	30% Non-fibrous (other)	None Detected
122JH-04A 131300296-0007	6th Floor Hall - Plaster Ceiling Skim Coat	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

Kevin Pine (10)

Steve Grise (6)

Renaldo Drakes, Laboratory Manager
or other approved signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Reporting limit is 1%
Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-10773 and VT AL357102

Initial report from 01/23/2013 16:20:04

**EMSL Analytical, Inc.**

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order: 131300296

CustomerID: ENVI54

CustomerPO:

ProjectID:

Attn: **Bob May**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
 Fax: (888) 838-1160
 Received: 01/23/13 9:45 AM
 Analysis Date: 1/23/2013
 Collected: 1/22/2013

Project: **20121327.A1E / Arlington High School**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
122JH-04B 131300296-0008	6th Floor Hall - Plaster Ceiling Skim Coat	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-05A 131300296-0009	6th Floor Hall - Plaster Ceiling Rough Coat	Gray Non-Fibrous Homogeneous	2% Hair	98% Non-fibrous (other)	None Detected
122JH-05B 131300296-0010	6th Floor Hall - Plaster Ceiling Rough Coat	Gray Non-Fibrous Homogeneous	2% Hair	98% Non-fibrous (other)	None Detected
122JH-06A 131300296-0011	5th Floor - Joint Compound; Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-06B 131300296-0012	Basement - Joint Compound; Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-07A 131300296-0013	5th Floor - Drywall; Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-07B 131300296-0014	Basement - Drywall; Ceiling	Gray/Tan Fibrous Heterogeneous	10% Cellulose	90% Non-fibrous (other)	None Detected
122JH-08 131300296-0015	5th Floor - Support Beam Skim Coat	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

Kevin Pine (10)

Steve Grise (6)

Renaldo Drakes, Laboratory Manager
or other approved signatory

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 Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-10773 and VT AL357102

Initial report from 01/23/2013 16:20:04



EMSL Analytical, Inc.

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order: 131300296

CustomerID: ENVI54

CustomerPO:

ProjectID:

Attn: **Bob May**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
Fax: (888) 838-1160
Received: 01/23/13 9:45 AM
Analysis Date: 1/23/2013
Collected: 1/22/2013

Project: **20121327.A1E / Arlington High School**

Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 and/or EPA 600/M4-82-020 Method(s) using Polarized Light Microscopy

Sample	Description	Appearance	Non-Asbestos		Asbestos
			% Fibrous	% Non-Fibrous	% Type
122JH-04C 131300296-0016	6th Floor Hall - Plaster Ceiling Skim Coat	White Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected
122JH-05C 131300296-0017	6th Floor Hall - Plaster Ceiling Rough Coat	Gray Non-Fibrous Homogeneous		100% Non-fibrous (other)	None Detected

Analyst(s)

Kevin Pine (10)

Steve Grise (6)

Renaldo Drakes, Laboratory Manager
or other approved signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Samples received in good condition unless otherwise noted. Estimated accuracy, precision and uncertainty data available upon request. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Reporting limit is 1%
Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-107T3 and VT AL357102

Initial report from 01/23/2013 16:20:04



50 Redfield St, Suite 100, Boston, MA 02122

(617) 282-4675 Fax (617) 282-8253

SAMPLE LOG FOR ASBESTOS BULKS

Sheet 1 of 2

Project Name: Arlington High School Project No. 20121327, A/E
Building: Arlington High School Project Manager: Bob May

Sample ID	Sample Location	Material	Result (%)
1 1225H-01A	6th Floor 606A	Grey leveling compound	
2 -01B	↓	under plywood	
X 01C			
3 -02A	↓	Brown Floor Tile under plywood + 12X12 Tile	
4 -02B	↓		
X 02C			
5 -03A	↓	Black Felt mastic A/W	
6 -03B	↓		
X 03C			
7 -04A	6th Floor Hall	Plaster ceiling skim coat	under dry wall
8 -04B	↓		↓
9 -05A	↓	Plaster ceiling rough coat	↓

Analysis Method: PLM Other

Turnaround Time 24 hr

SA 1/24/13

Based on the turnaround time indicated above, analyses are due to EnviroScience on or before this date: _____. Please call the EnviroScience Laboratory if analyses will be late at (860) 646-2469.

Fax Results to the EnviroScience Laboratory at: 888-838-1160.

Special Instruction: stop at first positive on each set. Do not point count

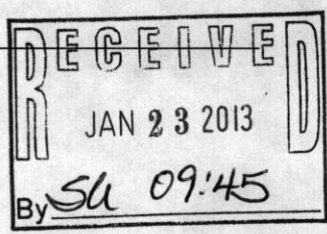
Samples collected by: JH Date: 1/22/13 Time: PM

Samples [Rec'd][Sent by] [JH] Date: [1/22/13] Time: PM

Samples Received by: _____ Date: _____ Time: _____

Shipped To: EMSL State MA Other _____

Method of Shipment: Fed Ex UPS Overnight UPS Ground Other





FUSS & O'NEILL
EnviroScience, LLC

50 Redfield St, Suite 100, Boston, MA 02122

www.fando.com

(617) 282-4675 Fax (617) 282-8253

SAMPLE LOG FOR ASBESTOS BULKS

Sheet 1 of 2

Project Name: Arlington High School Project No. 20121327, A/E
 Building: Arlington High School Project Manager: Bob May

Sample ID	Sample Location	Material	Result (%)
10 122JH-05B	↓		+
11 -06A	5th Floor	Joint compound (ceiling)	
12 -06B	Basement		
13 -07A	5th Floor	Drywall (ceiling)	
14 -07B	Basement		
15 -08	5th Floor	Support beam skin coat	
16 -04C	6th Floor Hall	Plaster ceiling skin coat	
17 -05C	↓	Plaster ceiling rough coat	
X			

Analysis Method: PLM Other

Turnaround Time 24 hr

Based on the turnaround time indicated above, analyses are due to EnviroScience on or before this date: _____ Please call the EnviroScience Laboratory if analyses will be late at (860) 646-2469.

Fax Results to the EnviroScience Laboratory at: 888-838-1160.

Special Instruction: stop at first positive on each set. Do not point count

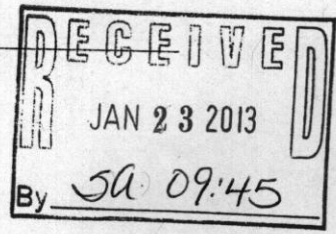
Samples collected by: JH Date: 1/22/13 Time: PM

Samples [Rec'd][Sent by] [JH] Date: [1/22/13] Time: PM

Samples Received by: _____ Date: _____ Time: _____

Shipped To: EMSL State MA Other _____

Method of Shipment: Fed Ex UPS Overnight UPS Ground Other _____



Appendix C

TEM Laboratory Analysis Results

**EMSL Analytical, Inc.**

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order:	131300296
CustomerID:	ENVI54
CustomerPO:	
ProjectID:	

Attn: **Bob May**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
 Fax: (888) 838-1160
 Received: 01/23/13 9:45 AM
 Analysis Date: 1/31/2013
 Collected: 1/22/2013

Project: 20121327.A1E / Arlington High School

Test Report: Asbestos Analysis of Non-Friable Organically Bound Materials by TEM via EPA/600/R-93/116 Section 2.5.5.1

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
122JH-03A 131300296-0005	6th Floor 606A - Black Felt Mastic a/w 02	Brown Fibrous Homogeneous	99.1	None	0.94% Chrysotile

Analyst(s) _____

Allison Libeskind (1)

Renaldo Drakes, Laboratory Manager
or other approved signatory

This laboratory is not responsible for % asbestos in total sample when the residue only is submitted for analysis. The above report relates only to the items tested. This report may not be reproduced, except in full, without written approval by EMSL Analytical, Inc. Samples received in good condition unless otherwise noted. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample.
 Samples analyzed by EMSL Analytical, Inc. Woburn, MA

Initial report from 01/31/2013 15:09:29

**EMSL Analytical, Inc.**

7 Constitution Way, Suite 107, Woburn, MA 01801

Phone/Fax: (781) 933-8411 / (781) 933-8412

bostonlab@emsl.com

EMSL Order:	131300266
CustomerID:	ENVI54
CustomerPO:	
ProjectID:	

Attn: **Dustin Diedricksen**
Fuss & O'Neill EnviroScience, LLC
146 Hartford Road
Manchester, CT 06040

Phone: (860) 646-2469
 Fax: (888) 838-1160
 Received: 01/21/13 9:20 AM
 Analysis Date: 1/31/2013
 Collected: 1/18/2013

Project: 20121327.A1E / Arlington High School; AHS Administrative Offices; T2 Architecture

Test Report: Asbestos Analysis of Non-Friable Organically Bound Materials by TEM via EPA/600/R-93/116 Section 2.5.5.1

SAMPLE ID	DESCRIPTION	APPEARANCE	% MATRIX MATERIAL	% NON-ASBESTOS FIBERS	ASBESTOS TYPES
0118-JH-05A 131300266-0013	Room 606A - 4" White Vinyl Baseboard	White Non-Fibrous Homogeneous	100	None	No Asbestos Detected
0118-JH-06B 131300266-0016	Room 610 - Brown Mastic a/w 4" White VBB	Brown Non-Fibrous Homogeneous	100	None	No Asbestos Detected
0118-JH-08A 131300266-0019	Room 610 - Carpet Glue	Tan Non-Fibrous Homogeneous	100	None	<0.25% Chrysotile
0118-JH-09A 131300266-0021	Roof - White Sealant on Air Handling Unit	Gray Non-Fibrous Homogeneous	100	None	No Asbestos Detected

Analyst(s)

Allison Libeskind (4)Renaldo Drakes, Laboratory Manager
or other approved signatory

This laboratory is not responsible for % asbestos in total sample when the residue only is submitted for analysis. The above report relates only to the items tested. This report may not be reproduced, except in full, without written approval by EMSL Analytical, Inc. Samples received in good condition unless otherwise noted. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA

Initial report from 01/31/2013 15:07:27

Appendix D

Lead Paint Testing Procedures and Equipment

STANDARD OPERATING PROCEDURES TESTING PROCEDURES AND EQUIPMENT

(Commonwealth of Massachusetts)

Massachusetts General Laws (M.G.L.) c. III, §190-199A 105CMR 460 with reference to lead based paint testing were consulted for this inspection. This regulation is administered by the Massachusetts Department of Public Health's Lead Poisoning Prevention Program. EnviroScience inspectors are licensed by the Commonwealth under this regulation.

This lead evaluation was either comprehensive or a determination. Both the proposed scope of work and the final report will note which type of evaluation was done. A comprehensive inspection means that representative painted surfaces were systematically evaluated on a room by room basis in accordance with the above referenced Massachusetts regulations.

A lead determination means that only a few surfaces were tested and that conclusions about untested areas cannot be reliably determined based on the limited testing that was done. A disclaimer will be employed in the report to note that the lead evaluation done is not in complete accordance with the testing protocol in the Massachusetts lead regulations.

Lead-based paint surfaces and components were identified by utilizing on-site x-ray fluorescence (XRF) instruments. EnviroScience Consultants, Inc. owns and maintains two different types of XRFs for testing for lead-based paint. These instruments are four (4) Radiation Monitoring Device LPA-1s (RMD) and a Scitec MAP 4 analyzer. Each of these instruments is operated in accordance with state and federal and manufacturer standards on the use of the instruments.

The federal government has developed Performance Characteristic Sheets (PCS) for each of the types of instruments cited above. Each instrument must be calibrated in accordance with these PCSs on a 1.0 milligram lead standard. Each of EnviroScience's instruments has one of these standards assigned to it. Some of the standards were purchased directly from the government and the others from the manufacturers of the instruments.

Readings (corrected for a substrate contribution, if applicable) of 1.0 mg/cm² or greater are considered to be dangerous levels of lead which must be abated (or in the case of certain metal components, just rendered intact) if a child under the age of six years has access to them and they are either on a defective surface, a chewable surface or a movable/impact surface on window components.

Prior to the start of any testing, a sketch of the building is drawn, and side designations are given to help identify exactly where readings were taken. Drawings depicting the room numbering scheme are located on the cover page(s) for the building(s) inspected. Each side of the building was labeled A, B, C or D. The "A" side of the unit is the side of primary entrance into a dwelling, and this room is always Room 1. Areas in the units include rooms, hallways, and closets. Areas are numbered in a clockwise fashion as building construction allows. This allows the inspector to indicate which substrate surface was tested. The type of hazard (if present) is described by circling the acronym on the testing form.

When more than one surface type was present on a side, the component tested was indicated with a number. If two windows were present on a building side, they were numbered left to right. Closet shelves and shelf supports were numbered top to bottom.

It is understood that the room layouts presented in the report are in conformance with the conditions that exist at the time the testing is performed. EnviroScience avoids labeling a room solely by its current functional use (i.e., living room, bedroom, etc.) since this use can change over time. Similarly, room layouts can change dramatically as dwellings are renovated and additions are built, incorporating existing rooms, or existing interior walls are moved or eliminated altogether.

Appendix E

Lead Testing Field Data Sheets



XRF LEAD SCREENING FIELD DATA SHEET

Inspector: John Hand + Luigi Marano Date: _____ XRF Model: RMD Serial: 1395
 Project Name: Arlington High School - AHS Administrative Offices Project Number: 20121327.AIE
 Address: 869 Massachusetts Avenue, 6th Floor Arlington MA 02476 Project PM: Bob May

XRF Calibration Check-RMD (0.7 to 1.3 mg/cm² inclusive)

	First Reading	Second Reading	Third Reading	Average
Start Check	1.0	1.0	1.0	1.0
Finish Check	1.0	1.0	1.0	1.0

Room	Side	Surface/Component	Substrate*	XRF Reading	Positive
Room # 603		Door Frame	M	-0.3	
Room # 603	A-D	DRY WALL WALLS	D	-0.4	
Room # 603	A	BRICK Wall	B	3.3	Y
Room # 604			M	-0.3	
Room # 605		Door Frame	M	-0.3	
Room # 605	A-D	Walls	W	-0.6	
Room # 606		Door Frame	M	-0.2	
Room # 606	A-D	Walls	D	-0.2	
Room # 606A		PLASTER ABOVE Radiator	P	1.3	Y
Room # 606A		WINDOW FRAMES	W	1.7	Y
Room # 606A		Walls	D	-0.2	
Room # 605A		Window Frame	W	1.2	Y
Room # 605A		PLASTER ABOVE Radiator	P	0.4	
Room # 605A	A-D	Walls	B	-0.3	
Room # 607	A-D	Walls	D	0.4	
Room # 607		Window Radiator	M	0.6	
Room # 607		Window Frame	W	1.4	Y
Room # 607		Door Frame	M	-0.2	
Room 609		Door Frame	M	-0.4	
Room # 609		Wall	D	-0.6	
Room # 609		Window Frame	W	1.5	
Room # 609		Walls	D	-0.5	

* Substrate Type: Metal = M, Wood = W, Plaster = P, Drywall = D, Concrete = C, Brick = B, Aluminum = A
 N/A: Not Accessible; N/C: Not Coated; COV: Covered; VR - Vinyl Replacement, POS = Positive



Project Name: Arlington High School

Project Number: 20121327.AIE

Room	Side	Surface/Component	Substrate	XRF Reading	Positive
Room # 609		RADIATOR	M	0.5	
Room # 610		Walls	D	-0.4	
Room # 610		Window Frame	W	1.2	Y

* Substrate Type: Metal = M, Wood = W, Plaster = P, Drywall = D, Concrete = C, Brick = B
N/A: Not Accessible; N/C: Not Coated; COV: Covered; VR - Vinyl Replacement, POS = Positive

Enviro-Safe Engineering

PO Box 440424

Somerville, MA 02144

(617)623-6678

December 7, 2012

Town of Arlington
730 Massachusetts Ave
Arlington, MA 02476

RE: Asbestos Inspection, Arlington High School, Arlington, MA

On December 4, 2012, Patricia E. Riley, Massachusetts licensed asbestos inspector AI60295, inspected the 6th floor office area that will be renovated at the above address for the presence of asbestos. The black and white 12" x 12" floor tile and associated mastic, the cove molding mastic, and the wall and ceiling material were suspected to contain asbestos. Bulk samples of the suspected asbestos containing materials were collected.

The samples were delivered to Covino Environmental Associates for analysis. The samples were analyzed by the EPA endorsed method of Polarized Light Microscopy with Dispersion Staining (PLM/DS) method. The PLM/DS is a qualitative and quantitative form of analysis that yields the type of asbestos in a sample, if any.

The bulk samples of the black and white 12" x 12" floor tile and the bulk sample of the associated mastic for the white 12" x 12" floor tile were positive for the presence of asbestos. There was insufficient material to test the associated mastic on the black 12" x 12" floor tile, but it should be assumed to contain asbestos. All other bulk samples were negative for the presence of asbestos. See enclosed results.

If you should require more information on this matter, please do not hesitate to contact me at (617) 623-6678.

Sincerely,



Patricia E. Riley
President

Covino Project No. 12-00001
 Samples Collected by: Phibens
 License # ATE 02295
 Date(s) Collected: 12-4-12

Client: ENVIRO-SAFE ENGINEERING
 P.O. BOX 440424
 SOMERVILLE, MA 02144
 Project Name: Arlington HS
 and Location: Arlington MA

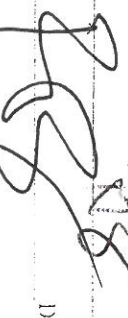
AQ918
 10th flr

Turnaround (cycle) same day 24-hr standard (5 day)
 Contact: PATRICIA RILEY
 Phone 617-623-6678
 Fax 617-623-9495

Sample ID	DO NOT WRITE IN SHADED AREAS	Stretoscope					Optical Properties						Fiber Ref.	Incl.	% Asbestos Fiber Present	% Non Asbestos Present							
		C	%	T	H	M	E	S	B	P	O	I				C	A	M	R	O	C	M	H
AG113 A	MATERIAL: black 12x12 floor tile LOCATION: hall			RTN								W117LN	15501556	7								93	
AG118 B	MATERIAL: mastic for A LOCATION: hall																						92
364005	MATERIAL: white 12x12 floor tile LOCATION: school committee room			NSN								W117LN	15491549	8									91
AG118 D	MATERIAL: mastic for C LOCATION: school committee room																						91
364007	MATERIAL: core molding mastic LOCATION: school committee room																						100
AG118 E	MATERIAL: wall LOCATION: hall by SPD office																						100
364009	MATERIAL: wall LOCATION: hall by SPD office																						100

Relinquished by: _____ Date: 12/4/12

Accepted _____ Rejected _____ Comments _____

Analyst's Signature:  Date(s) Analyzed: 12/6/12 Temp: 25C

Craving Project No. 12-00061

Samples Collected by: P. Riley

License #: ATE-02-95

Date(s) Collected: 12-4-12

Client: ENVIRO-SAFE ENGINEERING

P.O. BOX 44062

SOMERVILLE, MA 02144

Project Name: Arlington HS

and Location: Arlington HS

AQ118

John Riley

Turnaround (in clg) same day 24-hr standard (C to C)
Contact: LYRICAL RILEY
Phone: 617-623-6678
Fax: 617-623-9495

Sample ID	DO NOT WRITE IN SHADED AREAS	Microscope Visual	Optical Properties	Fiber Ref. Ind.	%Asbestos Fiber Present	% Non Asbestos Present	Fibrous Glass	Cellulose	Film	Synthetic	Other	Non-Fibrous
-----------	------------------------------	-------------------	--------------------	-----------------	-------------------------	------------------------	---------------	-----------	------	-----------	-------	-------------

Lab ID# _____
 MATERIAL: ceding
 LOCATION: male

LAB ID# _____
 MATERIAL: _____
 LOCATION: _____

LAB ID# _____
 MATERIAL: _____
 LOCATION: _____

LAB ID# _____
 MATERIAL: _____
 LOCATION: _____

LAB ID# _____
 MATERIAL: _____
 LOCATION: _____

LAB ID# _____
 MATERIAL: _____
 LOCATION: _____

Requester: _____ Date: _____
 Received by: _____
 Analyst's Signature: _____
 Date(s) Analyzed: 12/6/12 Temp: 25"

100



DEVAL L. PATRICK
Governor
TIMOTHY P. MURRAY
Lt. Governor

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

Prevailing Wage Rates

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

JOANNE F. GOLDSTEIN
Secretary
HEATHER E. ROWE
Director

Awarding Authority: Town of Arlington
Contract Number: 13-04 **City/Town:** ARLINGTON
Description of Work: Arlington High School 6th Floor Renovation - General Construction for Renovation of Administrative Offices at Arlington High School to include HVAC and Electrical.
Job Location: 869 Massachusetts Ave

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- Awarding authorities must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project. The wage schedule must be posted in a conspicuous place at the work site during the life of the project in accordance with M.G.L. c. 149, § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices must be registered with the Massachusetts Division of Apprenticeship Training (DAT) 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 DAT, he/she must be paid the "total rate" listed on the wage schedule regardless of experience or skills.
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports directly to the awarding authority and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at <http://www.mass.gov/dols/pw>.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.55	\$8.91	\$8.00	\$0.00	\$48.46
(3 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.62	\$8.91	\$8.00	\$0.00	\$48.53
(4 & 5 AXLE) DRIVER - EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.74	\$8.91	\$8.00	\$0.00	\$48.65
ADS/SUBMERSIBLE PILOT <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2012	\$82.32	\$9.80	\$17.67	\$0.00	\$109.79
	08/01/2013	\$85.47	\$9.80	\$17.67	\$0.00	\$112.94
	08/01/2014	\$88.62	\$9.80	\$17.67	\$0.00	\$116.09
	08/01/2015	\$91.77	\$9.80	\$17.67	\$0.00	\$119.24
AIR TRACK OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	06/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	12/01/2013	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	06/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	12/01/2014	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	06/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	12/01/2015	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	06/01/2016	\$38.30	\$7.10	\$12.45	\$0.00	\$57.85
	12/01/2016	\$39.30	\$7.10	\$12.45	\$0.00	\$58.85
For apprentice rates see "Apprentice- LABORER"						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. <i>ASBESTOS WORKERS LOCAL 6 (BOSTON)</i>	12/01/2012	\$29.08	\$10.40	\$5.95	\$0.00	\$45.43
	06/01/2013	\$29.88	\$10.40	\$5.95	\$0.00	\$46.23
	12/01/2013	\$30.68	\$10.40	\$5.95	\$0.00	\$47.03
	06/01/2014	\$31.58	\$10.40	\$5.95	\$0.00	\$47.93
	12/01/2014	\$32.48	\$10.40	\$5.95	\$0.00	\$48.83
	06/01/2015	\$33.43	\$10.40	\$5.95	\$0.00	\$49.78
	12/01/2015	\$34.38	\$10.40	\$5.95	\$0.00	\$50.73
ASPHALT RAKER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER <i>LABORERS - ZONE 1</i>	12/01/2012	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	06/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	12/01/2013	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	06/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	12/01/2014	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	06/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	12/01/2015	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	06/01/2016	\$38.30	\$7.10	\$12.45	\$0.00	\$57.85
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER <i>BOILERMAKERS LOCAL 29</i>	01/01/2010	\$37.70	\$6.97	\$11.18	\$0.00	\$55.85

Apprentice - BOILERMAKER - Local 29

Effective Date - 01/01/2010

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	\$24.51	\$6.97	\$11.18	\$0.00	\$42.66
2	65	\$24.51	\$6.97	\$11.18	\$0.00	\$42.66
3	70	\$26.39	\$6.97	\$11.18	\$0.00	\$44.54
4	75	\$28.28	\$6.97	\$11.18	\$0.00	\$46.43
5	80	\$30.16	\$6.97	\$11.18	\$0.00	\$48.31
6	85	\$32.05	\$6.97	\$11.18	\$0.00	\$50.20
7	90	\$33.93	\$6.97	\$11.18	\$0.00	\$52.08
8	95	\$35.82	\$6.97	\$11.18	\$0.00	\$53.97

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) <i>BRICKLAYERS LOCAL 3 (BOSTON)</i>	02/01/2013	\$47.41	\$10.18	\$17.83	\$0.00	\$75.42
	08/01/2013	\$48.31	\$10.18	\$17.90	\$0.00	\$76.39
	02/01/2014	\$48.87	\$10.18	\$17.90	\$0.00	\$76.95
	08/01/2014	\$49.77	\$10.18	\$17.97	\$0.00	\$77.92
	02/01/2015	\$50.33	\$10.18	\$17.97	\$0.00	\$78.48
	08/01/2015	\$51.23	\$10.18	\$18.04	\$0.00	\$79.45
	02/01/2016	\$51.80	\$10.18	\$18.04	\$0.00	\$80.02
	08/01/2016	\$52.70	\$10.18	\$18.12	\$0.00	\$81.00
	02/01/2017	\$53.27	\$10.18	\$18.12	\$0.00	\$81.57

Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Boston

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.71	\$10.18	\$17.83	\$0.00	\$51.72
2	60	\$28.45	\$10.18	\$17.83	\$0.00	\$56.46
3	70	\$33.19	\$10.18	\$17.83	\$0.00	\$61.20
4	80	\$37.93	\$10.18	\$17.83	\$0.00	\$65.94
5	90	\$42.67	\$10.18	\$17.83	\$0.00	\$70.68

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.16	\$10.18	\$17.90	\$0.00	\$52.24
2	60	\$28.99	\$10.18	\$17.90	\$0.00	\$57.07
3	70	\$33.82	\$10.18	\$17.90	\$0.00	\$61.90
4	80	\$38.65	\$10.18	\$17.90	\$0.00	\$66.73
5	90	\$43.48	\$10.18	\$17.90	\$0.00	\$71.56

Notes:

Apprentice to Journeyworker Ratio:1:5

BULLDOZER/GRADER/SCRAPER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

CAISSON & UNDERPINNING BOTTOM MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2012	\$33.45	\$7.10	\$12.60	\$0.00	\$53.15
	06/01/2013	\$34.20	\$7.10	\$12.60	\$0.00	\$53.90
	12/01/2013	\$34.95	\$7.10	\$12.60	\$0.00	\$54.65
	06/01/2014	\$35.70	\$7.10	\$12.60	\$0.00	\$55.40
	12/01/2014	\$36.45	\$7.10	\$12.60	\$0.00	\$56.15
	06/01/2015	\$37.20	\$7.10	\$12.60	\$0.00	\$56.90
	12/01/2015	\$37.95	\$7.10	\$12.60	\$0.00	\$57.65
	06/01/2016	\$38.70	\$7.10	\$12.60	\$0.00	\$58.40
	12/01/2016	\$39.70	\$7.10	\$12.60	\$0.00	\$59.40

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2012	\$32.30	\$7.10	\$12.60	\$0.00	\$52.00
	06/01/2013	\$33.05	\$7.10	\$12.60	\$0.00	\$52.75
	12/01/2013	\$33.80	\$7.10	\$12.60	\$0.00	\$53.50
	06/01/2014	\$34.55	\$7.10	\$12.60	\$0.00	\$54.25
	12/01/2014	\$35.30	\$7.10	\$12.60	\$0.00	\$55.00
	06/01/2015	\$36.05	\$7.10	\$12.60	\$0.00	\$55.75
	12/01/2015	\$36.80	\$7.10	\$12.60	\$0.00	\$56.50
	06/01/2016	\$37.55	\$7.10	\$12.60	\$0.00	\$57.25
	12/01/2016	\$38.55	\$7.10	\$12.60	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2012	\$32.30	\$7.10	\$12.60	\$0.00	\$52.00
	06/01/2013	\$33.05	\$7.10	\$12.60	\$0.00	\$52.75
	12/01/2013	\$33.80	\$7.10	\$12.60	\$0.00	\$53.50
	06/01/2014	\$34.55	\$7.10	\$12.60	\$0.00	\$54.25
	12/01/2014	\$35.30	\$7.10	\$12.60	\$0.00	\$55.00
	06/01/2015	\$36.05	\$7.10	\$12.60	\$0.00	\$55.75
	12/01/2015	\$36.80	\$7.10	\$12.60	\$0.00	\$56.50
	06/01/2016	\$37.55	\$7.10	\$12.60	\$0.00	\$57.25
	12/01/2016	\$38.55	\$7.10	\$12.60	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
CARPENTER <i>CARPENTERS -ZONE 2 (Eastern Massachusetts)</i>	03/01/2013	\$33.92	\$9.80	\$15.61	\$0.00	\$59.33
	09/01/2013	\$34.53	\$9.80	\$15.61	\$0.00	\$59.94
	03/01/2014	\$35.13	\$9.80	\$15.61	\$0.00	\$60.54
	09/01/2014	\$35.90	\$9.80	\$15.61	\$0.00	\$61.31
	03/01/2015	\$36.67	\$9.80	\$15.61	\$0.00	\$62.08

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - CARPENTER - Zone 2 Eastern MA

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.96	\$9.80	\$1.57	\$0.00	\$28.33
2	60	\$20.35	\$9.80	\$1.57	\$0.00	\$31.72
3	70	\$23.74	\$9.80	\$10.90	\$0.00	\$44.44
4	75	\$25.44	\$9.80	\$10.90	\$0.00	\$46.14
5	80	\$27.14	\$9.80	\$12.47	\$0.00	\$49.41
6	80	\$27.14	\$9.80	\$12.47	\$0.00	\$49.41
7	90	\$30.53	\$9.80	\$14.04	\$0.00	\$54.37
8	90	\$30.53	\$9.80	\$14.04	\$0.00	\$54.37

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.27	\$9.80	\$1.57	\$0.00	\$28.64
2	60	\$20.72	\$9.80	\$1.57	\$0.00	\$32.09
3	70	\$24.17	\$9.80	\$10.90	\$0.00	\$44.87
4	75	\$25.90	\$9.80	\$10.90	\$0.00	\$46.60
5	80	\$27.62	\$9.80	\$12.47	\$0.00	\$49.89
6	80	\$27.62	\$9.80	\$12.47	\$0.00	\$49.89
7	90	\$31.08	\$9.80	\$14.04	\$0.00	\$54.92
8	90	\$31.08	\$9.80	\$14.04	\$0.00	\$54.92

Notes:

Apprentice to Journeyworker Ratio:1:5

CEMENT MASONRY/PLASTERING	02/01/2013	\$42.87	\$10.50	\$18.61	\$1.30	\$73.28
BRICKLAYERS LOCAL 3 (BOSTON)	08/01/2013	\$43.62	\$10.50	\$18.61	\$1.30	\$74.03
	02/01/2014	\$44.05	\$10.50	\$18.61	\$1.30	\$74.46
	08/01/2014	\$44.80	\$10.50	\$18.61	\$1.30	\$75.21
	02/01/2015	\$45.23	\$10.50	\$18.61	\$1.30	\$75.64
	08/01/2015	\$45.98	\$10.50	\$18.61	\$1.30	\$76.39
	02/01/2016	\$46.43	\$10.50	\$18.61	\$1.30	\$76.84
	08/01/2016	\$47.18	\$10.50	\$18.61	\$1.30	\$77.59
	02/01/2017	\$47.63	\$10.50	\$18.61	\$1.30	\$78.04

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.44	\$10.50	\$12.11	\$1.30	\$45.35
2	60	\$25.72	\$10.50	\$13.61	\$1.30	\$51.13
3	65	\$27.87	\$10.50	\$14.61	\$1.30	\$54.28
4	70	\$30.01	\$10.50	\$15.61	\$1.30	\$57.42
5	75	\$32.15	\$10.50	\$16.61	\$1.30	\$60.56
6	80	\$34.30	\$10.50	\$17.61	\$1.30	\$63.71
7	90	\$38.58	\$10.50	\$18.61	\$1.30	\$68.99

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.81	\$10.50	\$12.11	\$1.30	\$45.72
2	60	\$26.17	\$10.50	\$13.61	\$1.30	\$51.58
3	65	\$28.35	\$10.50	\$14.61	\$1.30	\$54.76
4	70	\$30.53	\$10.50	\$15.61	\$1.30	\$57.94
5	75	\$32.72	\$10.50	\$16.61	\$1.30	\$61.13
6	80	\$34.90	\$10.50	\$17.61	\$1.30	\$64.31
7	90	\$39.26	\$10.50	\$18.61	\$1.30	\$69.67

Notes:
Steps are 6000 hours

Apprentice to Journeyworker Ratio:1:3

CHAIN SAW OPERATOR LABORERS - ZONE 1	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES OPERATING ENGINEERS LOCAL 4	12/01/2012	\$41.09	\$10.00	\$13.02	\$0.00	\$64.11
	06/01/2013	\$41.87	\$10.00	\$13.02	\$0.00	\$64.89
	12/01/2013	\$42.65	\$10.00	\$13.02	\$0.00	\$65.67

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

COMPRESSOR OPERATOR OPERATING ENGINEERS LOCAL 4	12/01/2012	\$28.17	\$10.00	\$13.02	\$0.00	\$51.19
	06/01/2013	\$28.72	\$10.00	\$13.02	\$0.00	\$51.74
	12/01/2013	\$29.27	\$10.00	\$13.02	\$0.00	\$52.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

DELEADER (BRIDGE) PAINTERS LOCAL 35 - ZONE 2	01/01/2013	\$45.01	\$7.80	\$15.60	\$0.00	\$68.41
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Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.51	\$7.80	\$0.00	\$0.00	\$30.31
2	55	\$24.76	\$7.80	\$3.52	\$0.00	\$36.08
3	60	\$27.01	\$7.80	\$3.84	\$0.00	\$38.65
4	65	\$29.26	\$7.80	\$4.16	\$0.00	\$41.22
5	70	\$31.51	\$7.80	\$13.68	\$0.00	\$52.99
6	75	\$33.76	\$7.80	\$14.00	\$0.00	\$55.56
7	80	\$36.01	\$7.80	\$14.32	\$0.00	\$58.13
8	90	\$40.51	\$7.80	\$14.96	\$0.00	\$63.27

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

DEMO: ADZEMAN <i>LABORERS - ZONE 1</i> For apprentice rates see "Apprentice- LABORER"	12/01/2011	\$31.80	\$7.10	\$12.45	\$0.00	\$51.35
DEMO: BACKHOE/LOADER/HAMMER OPERATOR <i>LABORERS - ZONE 1</i> For apprentice rates see "Apprentice- LABORER"	12/01/2011	\$32.80	\$7.10	\$12.45	\$0.00	\$52.35
DEMO: BURNERS <i>LABORERS - ZONE 1</i> For apprentice rates see "Apprentice- LABORER"	12/01/2011	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
DEMO: CONCRETE CUTTER/SAWYER <i>LABORERS - ZONE 1</i> For apprentice rates see "Apprentice- LABORER"	12/01/2011	\$32.80	\$7.10	\$12.45	\$0.00	\$52.35
DEMO: JACKHAMMER OPERATOR <i>LABORERS - ZONE 1</i> For apprentice rates see "Apprentice- LABORER"	12/01/2011	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
DEMO: WRECKING LABORER <i>LABORERS - ZONE 1</i> For apprentice rates see "Apprentice- LABORER"	12/01/2011	\$31.80	\$7.10	\$12.45	\$0.00	\$51.35
DIRECTIONAL DRILL MACHINE OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i> For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29
DIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2012	\$54.88	\$9.80	\$17.67	\$0.00	\$82.35
	08/01/2013	\$56.98	\$9.80	\$17.67	\$0.00	\$84.45
	08/01/2014	\$59.08	\$9.80	\$17.67	\$0.00	\$86.55
	08/01/2015	\$61.18	\$9.80	\$17.67	\$0.00	\$88.65
DIVER TENDER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2012	\$54.88	\$9.80	\$17.67	\$0.00	\$82.35
	08/01/2013	\$56.98	\$9.80	\$17.67	\$0.00	\$84.45
	08/01/2014	\$59.08	\$9.80	\$17.67	\$0.00	\$86.55
	08/01/2015	\$61.18	\$9.80	\$17.67	\$0.00	\$88.65

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIVER TENDER (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2012	\$58.80	\$9.80	\$17.67	\$0.00	\$86.27
	08/01/2013	\$61.05	\$9.80	\$17.67	\$0.00	\$88.52
	08/01/2014	\$63.30	\$9.80	\$17.67	\$0.00	\$90.77
	08/01/2015	\$65.55	\$9.80	\$17.67	\$0.00	\$93.02
DIVER/SLURRY (EFFLUENT) <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2012	\$82.32	\$9.80	\$17.67	\$0.00	\$109.79
	08/01/2013	\$85.47	\$9.80	\$17.67	\$0.00	\$112.94
	08/01/2014	\$88.62	\$9.80	\$17.67	\$0.00	\$116.09
	08/01/2015	\$91.77	\$9.80	\$17.67	\$0.00	\$119.24
DRAWBRIDGE OPERATOR (Construction) <i>ELECTRICIANS LOCAL 103</i>	03/01/2013	\$43.52	\$13.00	\$14.16	\$0.00	\$70.68
	09/01/2013	\$44.20	\$13.00	\$14.18	\$0.00	\$71.38
	03/01/2014	\$44.92	\$13.00	\$14.20	\$0.00	\$72.12
	09/01/2014	\$45.60	\$13.00	\$14.22	\$0.00	\$72.82
	03/01/2015	\$46.32	\$13.00	\$14.24	\$0.00	\$73.56
	09/01/2015	\$47.27	\$13.00	\$14.27	\$0.00	\$74.54
	03/01/2016	\$48.23	\$13.00	\$14.30	\$0.00	\$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
ELECTRICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2013	\$43.52	\$13.00	\$14.16	\$0.00	\$70.68
	09/01/2013	\$44.20	\$13.00	\$14.18	\$0.00	\$71.38
	03/01/2014	\$44.92	\$13.00	\$14.20	\$0.00	\$72.12
	09/01/2014	\$45.60	\$13.00	\$14.22	\$0.00	\$72.82
	03/01/2015	\$46.32	\$13.00	\$14.24	\$0.00	\$73.56
	09/01/2015	\$47.27	\$13.00	\$14.27	\$0.00	\$74.54
	03/01/2016	\$48.23	\$13.00	\$14.30	\$0.00	\$75.53

Apprentice - ELECTRICIAN - Local 103

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.41	\$13.00	\$0.52	\$0.00	\$30.93
2	40	\$17.41	\$13.00	\$0.52	\$0.00	\$30.93
3	45	\$19.58	\$13.00	\$10.53	\$0.00	\$43.11
4	45	\$19.58	\$13.00	\$10.53	\$0.00	\$43.11
5	50	\$21.76	\$13.00	\$10.85	\$0.00	\$45.61
6	55	\$23.94	\$13.00	\$11.19	\$0.00	\$48.13
7	60	\$26.11	\$13.00	\$11.51	\$0.00	\$50.62
8	65	\$28.29	\$13.00	\$11.85	\$0.00	\$53.14
9	70	\$30.46	\$13.00	\$12.17	\$0.00	\$55.63
10	75	\$32.64	\$13.00	\$12.51	\$0.00	\$58.15

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$17.68	\$13.00	\$0.53	\$0.00	\$31.21
2	40	\$17.68	\$13.00	\$0.53	\$0.00	\$31.21
3	45	\$19.89	\$13.00	\$10.54	\$0.00	\$43.43
4	45	\$19.89	\$13.00	\$10.54	\$0.00	\$43.43
5	50	\$22.10	\$13.00	\$10.86	\$0.00	\$45.96
6	55	\$24.31	\$13.00	\$11.20	\$0.00	\$48.51
7	60	\$26.52	\$13.00	\$11.53	\$0.00	\$51.05
8	65	\$28.73	\$13.00	\$11.86	\$0.00	\$53.59
9	70	\$30.94	\$13.00	\$12.19	\$0.00	\$56.13
10	75	\$33.15	\$13.00	\$12.53	\$0.00	\$58.68

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

Apprentice to Journeyworker Ratio:2:3***

ELEVATOR CONSTRUCTOR ELEVATOR CONSTRUCTORS LOCAL 4	01/01/2012	\$52.45	\$8.78	\$6.96	\$0.00	\$68.19
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Apprentice - ELEVATOR CONSTRUCTOR - Local 4

Effective Date - 01/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$26.23	\$8.78	\$0.00	\$0.00	\$35.01
2	55	\$28.85	\$8.78	\$6.96	\$0.00	\$44.59
3	65	\$34.09	\$8.78	\$6.96	\$0.00	\$49.83
4	70	\$36.72	\$8.78	\$6.96	\$0.00	\$52.46
5	80	\$41.96	\$8.78	\$6.96	\$0.00	\$57.70

Notes:

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

Apprentice to Journeyworker Ratio:1:1

ELEVATOR CONSTRUCTOR HELPER <i>ELEVATOR CONSTRUCTORS LOCAL 4</i>	01/01/2012	\$38.59	\$8.78	\$6.96	\$0.00	\$54.33
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FENCE & GUARD RAIL ERECTOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2012	\$38.26	\$10.00	\$12.65	\$0.00	\$60.91
	05/01/2013	\$38.87	\$10.00	\$12.65	\$0.00	\$61.52
	11/01/2013	\$39.63	\$10.00	\$12.65	\$0.00	\$62.28
	05/01/2014	\$40.40	\$10.00	\$12.65	\$0.00	\$63.05

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2012	\$39.66	\$10.00	\$12.65	\$0.00	\$62.31
	05/01/2013	\$40.28	\$10.00	\$12.65	\$0.00	\$62.93
	11/01/2013	\$41.05	\$10.00	\$12.65	\$0.00	\$63.70
	05/01/2014	\$41.82	\$10.00	\$12.65	\$0.00	\$64.47

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY <i>OPERATING ENGINEERS LOCAL 4</i>	11/01/2012	\$21.18	\$10.00	\$12.65	\$0.00	\$43.83
	05/01/2013	\$21.54	\$10.00	\$12.65	\$0.00	\$44.19
	11/01/2013	\$22.00	\$10.00	\$12.65	\$0.00	\$44.65
	05/01/2014	\$22.45	\$10.00	\$12.65	\$0.00	\$45.10

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIRE ALARM INSTALLER <i>ELECTRICIANS LOCAL 103</i>	03/01/2013	\$43.52	\$13.00	\$14.16	\$0.00	\$70.68
	09/01/2013	\$44.20	\$13.00	\$14.18	\$0.00	\$71.38
	03/01/2014	\$44.92	\$13.00	\$14.20	\$0.00	\$72.12
	09/01/2014	\$45.60	\$13.00	\$14.22	\$0.00	\$72.82
	03/01/2015	\$46.32	\$13.00	\$14.24	\$0.00	\$73.56
	09/01/2015	\$47.27	\$13.00	\$14.27	\$0.00	\$74.54
	03/01/2016	\$48.23	\$13.00	\$14.30	\$0.00	\$75.53
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING <i>ELECTRICIANS</i> <i>LOCAL 103</i>	03/01/2013	\$32.64	\$13.00	\$12.51	\$0.00	\$58.15
	09/01/2013	\$33.15	\$13.00	\$12.52	\$0.00	\$58.67
	03/01/2014	\$33.69	\$13.00	\$12.54	\$0.00	\$59.23
	09/01/2014	\$34.20	\$13.00	\$12.56	\$0.00	\$59.76
	03/01/2015	\$34.74	\$13.00	\$12.57	\$0.00	\$60.31
	09/01/2015	\$35.45	\$13.00	\$12.59	\$0.00	\$61.04
	03/01/2016	\$36.17	\$13.00	\$12.62	\$0.00	\$61.79
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$33.61	\$10.00	\$13.02	\$0.00	\$56.63
	06/01/2013	\$34.26	\$10.00	\$13.02	\$0.00	\$57.28
	12/01/2013	\$34.92	\$10.00	\$13.02	\$0.00	\$57.94
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER <i>LABORERS - ZONE 1</i>	12/01/2012	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2013	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	12/01/2013	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2014	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	12/01/2014	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2015	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	12/01/2015	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
	06/01/2016	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05
12/01/2016	\$20.50	\$7.10	\$12.45	\$0.00	\$40.05	
For apprentice rates see "Apprentice- LABORER"						
FLOORCOVERER <i>FLOORCOVERERS LOCAL 2168 ZONE 1</i>	03/01/2013	\$38.61	\$9.80	\$16.71	\$0.00	\$65.12
	09/01/2013	\$38.61	\$9.80	\$16.71	\$0.00	\$65.12
	03/01/2014	\$38.61	\$9.80	\$16.71	\$0.00	\$65.12

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - FLOORCOVERER - Local 2168 Zone I

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.31	\$9.80	\$1.79	\$0.00	\$30.90
2	55	\$21.24	\$9.80	\$1.79	\$0.00	\$32.83
3	60	\$23.17	\$9.80	\$11.34	\$0.00	\$44.31
4	65	\$25.10	\$9.80	\$11.34	\$0.00	\$46.24
5	70	\$27.03	\$9.80	\$13.13	\$0.00	\$49.96
6	75	\$28.96	\$9.80	\$13.13	\$0.00	\$51.89
7	80	\$30.89	\$9.80	\$14.92	\$0.00	\$55.61
8	85	\$32.82	\$9.80	\$14.92	\$0.00	\$57.54

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.31	\$9.80	\$1.79	\$0.00	\$30.90
2	55	\$21.24	\$9.80	\$1.79	\$0.00	\$32.83
3	60	\$23.17	\$9.80	\$11.34	\$0.00	\$44.31
4	65	\$25.10	\$9.80	\$11.34	\$0.00	\$46.24
5	70	\$27.03	\$9.80	\$13.13	\$0.00	\$49.96
6	75	\$28.96	\$9.80	\$13.13	\$0.00	\$51.89
7	80	\$30.89	\$9.80	\$14.92	\$0.00	\$55.61
8	85	\$32.82	\$9.80	\$14.92	\$0.00	\$57.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

FORK LIFT/CHERRY PICKER <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GENERATOR/LIGHTING PLANT/HEATERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$28.17	\$10.00	\$13.02	\$0.00	\$51.19
	06/01/2013	\$28.72	\$10.00	\$13.02	\$0.00	\$51.74
	12/01/2013	\$29.27	\$10.00	\$13.02	\$0.00	\$52.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) <i>GLAZIERS LOCAL 35 (ZONE 2)</i>	01/01/2013	\$35.51	\$7.80	\$14.60	\$0.00	\$57.91
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - GLAZIER - Local 35 Zone 2

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.76	\$7.80	\$0.00	\$0.00	\$25.56
2	55	\$19.53	\$7.80	\$3.25	\$0.00	\$30.58
3	60	\$21.31	\$7.80	\$3.54	\$0.00	\$32.65
4	65	\$23.08	\$7.80	\$3.84	\$0.00	\$34.72
5	70	\$24.86	\$7.80	\$12.83	\$0.00	\$45.49
6	75	\$26.63	\$7.80	\$13.13	\$0.00	\$47.56
7	80	\$28.41	\$7.80	\$13.42	\$0.00	\$49.63
8	90	\$31.96	\$7.80	\$14.01	\$0.00	\$53.77

Notes:
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

HOISTING ENGINEER/CRANES/GRADALLS	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
OPERATING ENGINEERS LOCAL 4	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - OPERATING ENGINEERS - Local 4

Effective Date - 12/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$22.05	\$10.00	\$0.00	\$0.00	\$32.05
2	60	\$24.05	\$10.00	\$13.02	\$0.00	\$47.07
3	65	\$26.06	\$10.00	\$13.02	\$0.00	\$49.08
4	70	\$28.06	\$10.00	\$13.02	\$0.00	\$51.08
5	75	\$30.07	\$10.00	\$13.02	\$0.00	\$53.09
6	80	\$32.07	\$10.00	\$13.02	\$0.00	\$55.09
7	85	\$34.08	\$10.00	\$13.02	\$0.00	\$57.10
8	90	\$36.08	\$10.00	\$13.02	\$0.00	\$59.10

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	\$22.48	\$10.00	\$0.00	\$0.00	\$32.48
2	60	\$24.52	\$10.00	\$13.02	\$0.00	\$47.54
3	65	\$26.57	\$10.00	\$13.02	\$0.00	\$49.59
4	70	\$28.61	\$10.00	\$13.02	\$0.00	\$51.63
5	75	\$30.65	\$10.00	\$13.02	\$0.00	\$53.67
6	80	\$32.70	\$10.00	\$13.02	\$0.00	\$55.72
7	85	\$34.74	\$10.00	\$13.02	\$0.00	\$57.76
8	90	\$36.78	\$10.00	\$13.02	\$0.00	\$59.80

Notes:

Apprentice to Journeyworker Ratio:1:6

HVAC (DUCTWORK) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2013	\$42.32	\$9.82	\$18.24	\$2.11	\$72.49
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For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (ELECTRICAL CONTROLS) ELECTRICIANS LOCAL 103	03/01/2013	\$43.52	\$13.00	\$14.16	\$0.00	\$70.68
	09/01/2013	\$44.20	\$13.00	\$14.18	\$0.00	\$71.38
	03/01/2014	\$44.92	\$13.00	\$14.20	\$0.00	\$72.12
	09/01/2014	\$45.60	\$13.00	\$14.22	\$0.00	\$72.82
	03/01/2015	\$46.32	\$13.00	\$14.24	\$0.00	\$73.56
	09/01/2015	\$47.27	\$13.00	\$14.27	\$0.00	\$74.54
	03/01/2016	\$48.23	\$13.00	\$14.30	\$0.00	\$75.53

For apprentice rates see "Apprentice- ELECTRICIAN"

HVAC (TESTING AND BALANCING - AIR) SHEETMETAL WORKERS LOCAL 17 - A	02/01/2013	\$42.32	\$9.82	\$18.24	\$2.11	\$72.49
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For apprentice rates see "Apprentice- SHEET METAL WORKER"

HVAC (TESTING AND BALANCING -WATER) PIPEFITTERS LOCAL 537	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
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For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

HVAC MECHANIC PIPEFITTERS LOCAL 537	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS <i>LABORERS - ZONE 1</i>	12/01/2012	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	06/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	12/01/2013	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	06/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	12/01/2014	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	06/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	12/01/2015	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	06/01/2016	\$38.30	\$7.10	\$12.45	\$0.00	\$57.85
	12/01/2016	\$39.30	\$7.10	\$12.45	\$0.00	\$58.85
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) <i>ASBESTOS WORKERS LOCAL 6 (BOSTON)</i>	09/01/2012	\$41.46	\$10.65	\$11.50	\$0.00	\$63.61
	09/01/2013	\$43.06	\$10.65	\$11.50	\$0.00	\$65.21
	09/01/2014	\$45.06	\$10.65	\$11.50	\$0.00	\$67.21

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

Effective Date - 09/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.73	\$10.65	\$8.60	\$0.00	\$39.98
2	60	\$24.88	\$10.65	\$9.18	\$0.00	\$44.71
3	70	\$29.02	\$10.65	\$9.76	\$0.00	\$49.43
4	80	\$33.17	\$10.65	\$10.34	\$0.00	\$54.16

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$21.53	\$10.65	\$8.60	\$0.00	\$40.78
2	60	\$25.84	\$10.65	\$9.18	\$0.00	\$45.67
3	70	\$30.14	\$10.65	\$9.76	\$0.00	\$50.55
4	80	\$34.45	\$10.65	\$10.34	\$0.00	\$55.44

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

IRONWORKER/WELDER <i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i>	09/16/2012	\$38.98	\$7.70	\$18.35	\$0.00	\$65.03
	03/16/2013	\$40.23	\$7.70	\$18.35	\$0.00	\$66.28

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - IRONWORKER - Local 7 Boston

Effective Date - 09/16/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$23.39	\$7.70	\$18.35	\$0.00	\$49.44
2	70	\$27.29	\$7.70	\$18.35	\$0.00	\$53.34
3	75	\$29.24	\$7.70	\$18.35	\$0.00	\$55.29
4	80	\$31.18	\$7.70	\$18.35	\$0.00	\$57.23
5	85	\$33.13	\$7.70	\$18.35	\$0.00	\$59.18
6	90	\$35.08	\$7.70	\$18.35	\$0.00	\$61.13

Effective Date - 03/16/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$24.14	\$7.70	\$18.35	\$0.00	\$50.19
2	70	\$28.16	\$7.70	\$18.35	\$0.00	\$54.21
3	75	\$30.17	\$7.70	\$18.35	\$0.00	\$56.22
4	80	\$32.18	\$7.70	\$18.35	\$0.00	\$58.23
5	85	\$34.20	\$7.70	\$18.35	\$0.00	\$60.25
6	90	\$36.21	\$7.70	\$18.35	\$0.00	\$62.26

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR LABORERS - ZONE 1	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

LABORER LABORERS - ZONE 1	12/01/2012	\$32.30	\$7.10	\$12.45	\$0.00	\$51.85
	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - LABORER - Zone 1

Effective Date - 12/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.38	\$7.10	\$12.45	\$0.00	\$38.93
2	70	\$22.61	\$7.10	\$12.45	\$0.00	\$42.16
3	80	\$25.84	\$7.10	\$12.45	\$0.00	\$45.39
4	90	\$29.07	\$7.10	\$12.45	\$0.00	\$48.62

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$19.83	\$7.10	\$12.45	\$0.00	\$39.38
2	70	\$23.14	\$7.10	\$12.45	\$0.00	\$42.69
3	80	\$26.44	\$7.10	\$12.45	\$0.00	\$45.99
4	90	\$29.75	\$7.10	\$12.45	\$0.00	\$49.30

Notes:

Apprentice to Journeyworker Ratio:1:5

LABORER: CARPENTER TENDER LABORERS - ZONE 1	12/01/2012	\$32.30	\$7.10	\$12.45	\$0.00	\$51.85
	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

For apprentice rates see "Apprentice- LABORER"

LABORER: CEMENT FINISHER TENDER LABORERS - ZONE 1	12/01/2012	\$32.30	\$7.10	\$12.45	\$0.00	\$51.85
	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

For apprentice rates see "Apprentice- LABORER"

LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER LABORERS - ZONE 1	12/01/2011	\$31.80	\$7.10	\$12.45	\$0.00	\$51.35
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For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: MASON TENDER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
LABORER: MULTI-TRADE TENDER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.30	\$7.10	\$12.45	\$0.00	\$51.85
	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10
For apprentice rates see "Apprentice- LABORER"						
LABORER: TREE REMOVER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.30	\$7.10	\$12.45	\$0.00	\$51.85
	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10
This classification applies to the wholesale removal of standing trees including all associated trimming of branches and limbs, and applies to the removal of branches at locations not on or around utility lines. For apprentice rates see "Apprentice- LABORER"						
LASER BEAM OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2013	\$36.20	\$10.18	\$16.51	\$0.00	\$62.89
	08/01/2013	\$36.91	\$10.18	\$16.58	\$0.00	\$63.67
	02/01/2014	\$37.36	\$10.18	\$16.58	\$0.00	\$64.12
	08/01/2014	\$38.07	\$10.18	\$16.65	\$0.00	\$64.90
	02/01/2015	\$38.52	\$10.18	\$16.65	\$0.00	\$65.35
	08/01/2015	\$39.23	\$10.18	\$16.72	\$0.00	\$66.13
	02/01/2016	\$39.68	\$10.18	\$16.72	\$0.00	\$66.58
	08/01/2016	\$40.38	\$10.18	\$16.80	\$0.00	\$67.36
	02/01/2017	\$40.84	\$10.18	\$16.80	\$0.00	\$67.82

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

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.10	\$10.18	\$16.51	\$0.00	\$44.79
2	60	\$21.72	\$10.18	\$16.51	\$0.00	\$48.41
3	70	\$25.34	\$10.18	\$16.51	\$0.00	\$52.03
4	80	\$28.96	\$10.18	\$16.51	\$0.00	\$55.65
5	90	\$32.58	\$10.18	\$16.51	\$0.00	\$59.27

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.46	\$10.18	\$16.58	\$0.00	\$45.22
2	60	\$22.15	\$10.18	\$16.58	\$0.00	\$48.91
3	70	\$25.84	\$10.18	\$16.58	\$0.00	\$52.60
4	80	\$29.53	\$10.18	\$16.58	\$0.00	\$56.29
5	90	\$33.22	\$10.18	\$16.58	\$0.00	\$59.98

Notes:

Apprentice to Journeyworker Ratio:1:3

MARBLE MASONS, TILELAYERS & TERRAZZO MECH <i>BRICKLAYERS LOCAL 3 - MARBLE & TILE</i>	02/01/2013	\$47.45	\$10.18	\$17.83	\$0.00	\$75.46
	08/01/2013	\$48.35	\$10.18	\$17.90	\$0.00	\$76.43
	02/01/2014	\$48.91	\$10.18	\$17.90	\$0.00	\$76.99
	08/01/2014	\$49.81	\$10.18	\$17.97	\$0.00	\$77.96
	02/01/2015	\$50.37	\$10.18	\$17.97	\$0.00	\$78.52
	08/01/2015	\$51.27	\$10.18	\$18.04	\$0.00	\$79.49
	02/01/2016	\$51.84	\$10.18	\$18.04	\$0.00	\$80.06
	08/01/2016	\$52.74	\$10.18	\$18.12	\$0.00	\$81.04
	02/01/2017	\$53.31	\$10.18	\$18.12	\$0.00	\$81.61

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

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

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.73	\$10.18	\$17.83	\$0.00	\$51.74
2	60	\$28.47	\$10.18	\$17.83	\$0.00	\$56.48
3	70	\$33.22	\$10.18	\$17.83	\$0.00	\$61.23
4	80	\$37.96	\$10.18	\$17.83	\$0.00	\$65.97
5	90	\$42.71	\$10.18	\$17.83	\$0.00	\$70.72

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$24.18	\$10.18	\$17.90	\$0.00	\$52.26
2	60	\$29.01	\$10.18	\$17.90	\$0.00	\$57.09
3	70	\$33.85	\$10.18	\$17.90	\$0.00	\$61.93
4	80	\$38.68	\$10.18	\$17.90	\$0.00	\$66.76
5	90	\$43.52	\$10.18	\$17.90	\$0.00	\$71.60

Notes:

Apprentice to Journeyworker Ratio:1:5

MECH. SWEEPER OPERATOR (ON CONST. SITES) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MECHANICS MAINTENANCE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

MILLWRIGHT (Zone 1) <i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>	04/01/2011	\$33.57	\$8.67	\$15.61	\$0.00	\$57.85
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - MILLWRIGHT - Local 1121 Zone 1

Effective Date - 04/01/2011

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.79	\$8.67	\$11.64	\$0.00	\$37.10
2	55	\$18.46	\$8.67	\$11.64	\$0.00	\$38.77
3	60	\$20.14	\$8.67	\$13.23	\$0.00	\$42.04
4	65	\$21.82	\$8.67	\$13.23	\$0.00	\$43.72
5	70	\$23.50	\$8.67	\$14.02	\$0.00	\$46.19
6	75	\$25.18	\$8.67	\$14.02	\$0.00	\$47.87
7	80	\$26.86	\$8.67	\$14.82	\$0.00	\$50.35
8	85	\$28.53	\$8.67	\$14.82	\$0.00	\$52.02

Notes:

Apprentice to Journeyworker Ratio:1:5

MORTAR MIXER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

OILER (OTHER THAN TRUCK CRANES,GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$21.28	\$10.00	\$13.02	\$0.00	\$44.30
	06/01/2013	\$21.70	\$10.00	\$13.02	\$0.00	\$44.72
	12/01/2013	\$22.12	\$10.00	\$13.02	\$0.00	\$45.14

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OILER (TRUCK CRANES, GRADALLS) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$24.62	\$10.00	\$13.02	\$0.00	\$47.64
	06/01/2013	\$25.10	\$10.00	\$13.02	\$0.00	\$48.12
	12/01/2013	\$25.59	\$10.00	\$13.02	\$0.00	\$48.61

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

OTHER POWER DRIVEN EQUIPMENT - CLASS II <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

PAINTER (BRIDGES/TANKS) <i>PAINTERS LOCAL 35 - ZONE 2</i>	01/01/2013	\$45.01	\$7.80	\$15.60	\$0.00	\$68.41
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$22.51	\$7.80	\$0.00	\$0.00	\$30.31
2	55	\$24.76	\$7.80	\$3.52	\$0.00	\$36.08
3	60	\$27.01	\$7.80	\$3.84	\$0.00	\$38.65
4	65	\$29.26	\$7.80	\$4.16	\$0.00	\$41.22
5	70	\$31.51	\$7.80	\$13.68	\$0.00	\$52.99
6	75	\$33.76	\$7.80	\$14.00	\$0.00	\$55.56
7	80	\$36.01	\$7.80	\$14.32	\$0.00	\$58.13
8	90	\$40.51	\$7.80	\$14.96	\$0.00	\$63.27

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, NEW) *	01/01/2013	\$35.91	\$7.80	\$15.60	\$0.00	\$59.31
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* If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. *PAINTERS LOCAL 35 - ZONE 2*

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

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.96	\$7.80	\$0.00	\$0.00	\$25.76
2	55	\$19.75	\$7.80	\$3.52	\$0.00	\$31.07
3	60	\$21.55	\$7.80	\$3.84	\$0.00	\$33.19
4	65	\$23.34	\$7.80	\$4.16	\$0.00	\$35.30
5	70	\$25.14	\$7.80	\$13.68	\$0.00	\$46.62
6	75	\$26.93	\$7.80	\$14.00	\$0.00	\$48.73
7	80	\$28.73	\$7.80	\$14.32	\$0.00	\$50.85
8	90	\$32.32	\$7.80	\$14.96	\$0.00	\$55.08

Notes:

Apprentice to Journeyworker Ratio:1:1

PAINTER (SPRAY OR SANDBLAST, REPAINT)	01/01/2013	\$33.97	\$7.80	\$15.60	\$0.00	\$57.37
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PAINTERS LOCAL 35 - ZONE 2

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

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

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.99	\$7.80	\$0.00	\$0.00	\$24.79
2	55	\$18.68	\$7.80	\$3.52	\$0.00	\$30.00
3	60	\$20.38	\$7.80	\$3.84	\$0.00	\$32.02
4	65	\$22.08	\$7.80	\$4.16	\$0.00	\$34.04
5	70	\$23.78	\$7.80	\$13.68	\$0.00	\$45.26
6	75	\$25.48	\$7.80	\$14.00	\$0.00	\$47.28
7	80	\$27.18	\$7.80	\$14.32	\$0.00	\$49.30
8	90	\$30.57	\$7.80	\$14.96	\$0.00	\$53.33

Notes:

Apprentice to Journeyworker Ratio:1:1

PAINTER (TRAFFIC MARKINGS) LABORERS - ZONE 1	12/01/2012	\$32.30	\$7.10	\$12.45	\$0.00	\$51.85
	06/01/2013	\$33.05	\$7.10	\$12.45	\$0.00	\$52.60
	12/01/2013	\$33.80	\$7.10	\$12.45	\$0.00	\$53.35
	06/01/2014	\$34.55	\$7.10	\$12.45	\$0.00	\$54.10
	12/01/2014	\$35.30	\$7.10	\$12.45	\$0.00	\$54.85
	06/01/2015	\$36.05	\$7.10	\$12.45	\$0.00	\$55.60
	12/01/2015	\$36.80	\$7.10	\$12.45	\$0.00	\$56.35
	06/01/2016	\$37.55	\$7.10	\$12.45	\$0.00	\$57.10
	12/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10

For Apprentice rates see "Apprentice- LABORER"

PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2	01/01/2013	\$34.51	\$7.80	\$15.60	\$0.00	\$57.91
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$17.26	\$7.80	\$0.00	\$0.00	\$25.06
2	55	\$18.98	\$7.80	\$3.52	\$0.00	\$30.30
3	60	\$20.71	\$7.80	\$3.84	\$0.00	\$32.35
4	65	\$22.43	\$7.80	\$4.16	\$0.00	\$34.39
5	70	\$24.16	\$7.80	\$13.68	\$0.00	\$45.64
6	75	\$25.88	\$7.80	\$14.00	\$0.00	\$47.68
7	80	\$27.61	\$7.80	\$14.32	\$0.00	\$49.73
8	90	\$31.06	\$7.80	\$14.96	\$0.00	\$53.82

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) PAINTERS LOCAL 35 - ZONE 2	01/01/2013	\$32.57	\$7.80	\$15.60	\$0.00	\$55.97
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Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT

Effective Date - 01/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$16.29	\$7.80	\$0.00	\$0.00	\$24.09
2	55	\$17.91	\$7.80	\$3.52	\$0.00	\$29.23
3	60	\$19.54	\$7.80	\$3.84	\$0.00	\$31.18
4	65	\$21.17	\$7.80	\$4.16	\$0.00	\$33.13
5	70	\$22.80	\$7.80	\$13.68	\$0.00	\$44.28
6	75	\$24.43	\$7.80	\$14.00	\$0.00	\$46.23
7	80	\$26.06	\$7.80	\$14.32	\$0.00	\$48.18
8	90	\$29.31	\$7.80	\$14.96	\$0.00	\$52.07

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PANEL & PICKUP TRUCKS DRIVER TEAMSTERS JOINT COUNCIL NO. 10 ZONE A	12/01/2012	\$31.38	\$8.91	\$8.00	\$0.00	\$48.29
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) PILE DRIVER LOCAL 56 (ZONE 1)	08/01/2012	\$39.20	\$9.80	\$17.67	\$0.00	\$66.67
	08/01/2013	\$40.70	\$9.80	\$17.67	\$0.00	\$68.17
	08/01/2014	\$42.20	\$9.80	\$17.67	\$0.00	\$69.67
	08/01/2015	\$43.70	\$9.80	\$17.67	\$0.00	\$71.17

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PILE DRIVER <i>PILE DRIVER LOCAL 56 (ZONE 1)</i>	08/01/2012	\$39.20	\$9.80	\$17.67	\$0.00	\$66.67
	08/01/2013	\$40.70	\$9.80	\$17.67	\$0.00	\$68.17
	08/01/2014	\$42.20	\$9.80	\$17.67	\$0.00	\$69.67
	08/01/2015	\$43.70	\$9.80	\$17.67	\$0.00	\$71.17

Apprentice - PILE DRIVER - Local 56 Zone 1

Effective Date - 08/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$19.60	\$9.80	\$17.67	\$0.00	\$47.07
2	60	\$23.52	\$9.80	\$17.67	\$0.00	\$50.99
3	70	\$27.44	\$9.80	\$17.67	\$0.00	\$54.91
4	75	\$29.40	\$9.80	\$17.67	\$0.00	\$56.87
5	80	\$31.36	\$9.80	\$17.67	\$0.00	\$58.83
6	80	\$31.36	\$9.80	\$17.67	\$0.00	\$58.83
7	90	\$35.28	\$9.80	\$17.67	\$0.00	\$62.75
8	90	\$35.28	\$9.80	\$17.67	\$0.00	\$62.75

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$20.35	\$9.80	\$17.67	\$0.00	\$47.82
2	60	\$24.42	\$9.80	\$17.67	\$0.00	\$51.89
3	70	\$28.49	\$9.80	\$17.67	\$0.00	\$55.96
4	75	\$30.53	\$9.80	\$17.67	\$0.00	\$58.00
5	80	\$32.56	\$9.80	\$17.67	\$0.00	\$60.03
6	80	\$32.56	\$9.80	\$17.67	\$0.00	\$60.03
7	90	\$36.63	\$9.80	\$17.67	\$0.00	\$64.10
8	90	\$36.63	\$9.80	\$17.67	\$0.00	\$64.10

Notes:

Apprentice to Journeyworker Ratio:1:3

PIPEFITTER & STEAMFITTER <i>PIPEFITTERS LOCAL 537</i>	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
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Apprentice - PIPEFITTER - Local 537

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$19.74	\$8.75	\$6.50	\$0.00	\$34.99
2	45	\$22.20	\$8.75	\$14.39	\$0.00	\$45.34
3	60	\$29.60	\$8.75	\$14.39	\$0.00	\$52.74
4	70	\$34.54	\$8.75	\$14.39	\$0.00	\$57.68
5	80	\$39.47	\$8.75	\$14.39	\$0.00	\$62.61

Notes:
 ** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
 Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

PIPELAYER <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

PLUMBERS & GASFITTERS <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2013	\$49.31	\$9.32	\$13.29	\$0.00	\$71.92
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Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$17.26	\$9.32	\$4.97	\$0.00	\$31.55
2	40	\$19.72	\$9.32	\$5.61	\$0.00	\$34.65
3	55	\$27.12	\$9.32	\$7.53	\$0.00	\$43.97
4	65	\$32.05	\$9.32	\$8.81	\$0.00	\$50.18
5	75	\$36.98	\$9.32	\$10.09	\$0.00	\$56.39

Notes:
 ** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
 Step4 with lic\$53.29 Step5 with lic\$59.49

Apprentice to Journeyworker Ratio:**

PNEUMATIC CONTROLS (TEMP.) <i>PIPEFITTERS LOCAL 537</i>	03/01/2013	\$49.34	\$8.75	\$14.39	\$0.00	\$72.48
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For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER <i>LABORERS - ZONE 1</i>	12/01/2012	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	06/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	12/01/2013	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	06/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	12/01/2014	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	06/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	12/01/2015	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	06/01/2016	\$38.55	\$7.10	\$12.45	\$0.00	\$58.10
	12/01/2016	\$39.55	\$7.10	\$12.45	\$0.00	\$59.10
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$28.17	\$10.00	\$13.02	\$0.00	\$51.19
	06/01/2013	\$28.72	\$10.00	\$13.02	\$0.00	\$51.74
	12/01/2013	\$29.27	\$10.00	\$13.02	\$0.00	\$52.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY-MIX CONCRETE DRIVER <i>TEAMSTERS LOCAL 25c</i>	05/01/2011	\$31.21	\$7.25	\$6.19	\$0.00	\$44.65
RECLAIMERS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
RESIDENTIAL WOOD FRAME (All Other Work) <i>CARPENTERS -ZONE 2 (Residential Wood)</i>	04/01/2011	\$24.24	\$8.67	\$15.51	\$0.00	\$48.42
RESIDENTIAL WOOD FRAME CARPENTER **	05/01/2011	\$24.24	\$6.34	\$6.23	\$0.00	\$36.81

** The Residential Wood Frame Carpenter classification applies only to the construction of new, wood frame residences that do not exceed four stories including the basement. *CARPENTERS -ZONE 2 (Residential Wood)*

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

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
RIDE-ON MOTORIZED BUGGY OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
	12/01/2016	\$38.80	\$7.10	\$12.45	\$0.00	\$58.35

For apprentice rates see "Apprentice- LABORER"

ROLLER/SPREADER/MULCHING MACHINE <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

ROOFER (Inc.Roofing Waterproofing &Roofing Damproofing) <i>ROOFERS LOCAL 33</i>	02/01/2013	\$37.41	\$10.50	\$10.70	\$0.00	\$58.61
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Apprentice - ROOFER - Local 33

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$18.71	\$10.50	\$3.38	\$0.00	\$32.59
2	60	\$22.45	\$10.50	\$10.70	\$0.00	\$43.65
3	65	\$24.32	\$10.50	\$10.70	\$0.00	\$45.52
4	75	\$28.06	\$10.50	\$10.70	\$0.00	\$49.26
5	85	\$31.80	\$10.50	\$10.70	\$0.00	\$53.00

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.

Apprentice to Journeyworker Ratio:**

ROOFER SLATE / TILE / PRECAST CONCRETE <i>ROOFERS LOCAL 33</i>	02/01/2013	\$37.66	\$10.50	\$10.70	\$0.00	\$58.86
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For apprentice rates see "Apprentice- ROOFER"

SHEETMETAL WORKER <i>SHEETMETAL WORKERS LOCAL 17 - A</i>	02/01/2013	\$42.32	\$9.82	\$18.24	\$2.11	\$72.49
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Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SHEET METAL WORKER - Local 17-A

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$16.93	\$9.82	\$4.00	\$0.00	\$30.75
2	40	\$16.93	\$9.82	\$4.00	\$0.00	\$30.75
3	45	\$19.04	\$9.82	\$8.00	\$1.11	\$37.97
4	45	\$19.04	\$9.82	\$8.00	\$1.11	\$37.97
5	50	\$21.16	\$9.82	\$8.75	\$1.19	\$40.92
6	50	\$21.16	\$9.82	\$9.00	\$1.20	\$41.18
7	60	\$25.39	\$9.82	\$10.24	\$1.36	\$46.81
8	65	\$27.51	\$9.82	\$10.99	\$1.45	\$49.77
9	75	\$31.74	\$9.82	\$12.49	\$1.62	\$55.67
10	85	\$35.97	\$9.82	\$13.49	\$1.78	\$61.06

Notes:
Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SIGN ERECTOR	06/01/2012	\$25.37	\$6.82	\$6.85	\$0.00	\$39.04
PAINTERS LOCAL 35 - ZONE 2	06/01/2013	\$25.81	\$7.07	\$7.05	\$0.00	\$39.93

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SIGN ERECTOR - Local 35 Zone 2

Effective Date - 06/01/2012

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$12.69	\$6.82	\$0.00	\$0.00	\$19.51
2	55	\$13.95	\$6.82	\$2.35	\$0.00	\$23.12
3	60	\$15.22	\$6.82	\$2.35	\$0.00	\$24.39
4	65	\$16.49	\$6.82	\$2.35	\$0.00	\$25.66
5	70	\$17.76	\$6.82	\$6.85	\$0.00	\$31.43
6	75	\$19.03	\$6.82	\$6.85	\$0.00	\$32.70
7	80	\$20.30	\$6.82	\$6.85	\$0.00	\$33.97
8	85	\$21.56	\$6.82	\$6.85	\$0.00	\$35.23
9	90	\$22.83	\$6.82	\$6.85	\$0.00	\$36.50

Effective Date - 06/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$12.91	\$7.07	\$0.00	\$0.00	\$19.98
2	55	\$14.20	\$7.07	\$2.45	\$0.00	\$23.72
3	60	\$15.49	\$7.07	\$2.45	\$0.00	\$25.01
4	65	\$16.78	\$7.07	\$2.45	\$0.00	\$26.30
5	70	\$18.07	\$7.07	\$7.05	\$0.00	\$32.19
6	75	\$19.36	\$7.07	\$7.05	\$0.00	\$33.48
7	80	\$20.65	\$7.07	\$7.05	\$0.00	\$34.77
8	85	\$21.94	\$7.07	\$7.05	\$0.00	\$36.06
9	90	\$23.23	\$7.07	\$7.05	\$0.00	\$37.35

Notes:

Steps are 4 mos.

Apprentice to Journeyworker Ratio:1:1

SPECIALIZED EARTH MOVING EQUIP < 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.84	\$8.91	\$8.00	\$0.00	\$48.75
SPECIALIZED EARTH MOVING EQUIP > 35 TONS <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$32.13	\$8.91	\$8.00	\$0.00	\$49.04
SPRINKLER FITTER <i>SPRINKLER FITTERS LOCAL 550 - (Section A)</i>	03/01/2013	\$52.58	\$8.42	\$12.60	\$0.00	\$73.60

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - SPRINKLER FITTER - Local 550

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	\$18.40	\$8.42	\$8.00	\$0.00	\$34.82
2	40	\$21.03	\$8.42	\$8.00	\$0.00	\$37.45
3	45	\$23.66	\$8.42	\$8.00	\$0.00	\$40.08
4	50	\$26.29	\$8.42	\$8.00	\$0.00	\$42.71
5	55	\$28.92	\$8.42	\$8.00	\$0.00	\$45.34
6	60	\$31.55	\$8.42	\$8.00	\$0.00	\$47.97
7	65	\$34.18	\$8.42	\$8.00	\$0.00	\$50.60
8	70	\$36.81	\$8.42	\$8.00	\$0.00	\$53.23
9	75	\$39.44	\$8.42	\$8.00	\$0.00	\$55.86
10	80	\$42.06	\$8.42	\$8.00	\$0.00	\$58.48

Notes:
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:1

STEAM BOILER OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TELECOMMUNICATION TECHNICIAN <i>ELECTRICIANS LOCAL 103</i>	03/01/2013	\$32.64	\$13.00	\$12.51	\$0.00	\$58.15
	09/01/2013	\$33.15	\$13.00	\$12.52	\$0.00	\$58.67
	03/01/2014	\$33.69	\$13.00	\$12.54	\$0.00	\$59.23
	09/01/2014	\$34.20	\$13.00	\$12.56	\$0.00	\$59.76
	03/01/2015	\$34.74	\$13.00	\$12.57	\$0.00	\$60.31
	09/01/2015	\$35.45	\$13.00	\$12.59	\$0.00	\$61.04
	03/01/2016	\$36.17	\$13.00	\$12.62	\$0.00	\$61.79

Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103

Effective Date - 03/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$13.06	\$13.00	\$0.39	\$0.00	\$26.45
2	40	\$13.06	\$13.00	\$0.39	\$0.00	\$26.45
3	45	\$14.69	\$13.00	\$10.77	\$0.00	\$38.46
4	45	\$14.69	\$13.00	\$10.77	\$0.00	\$38.46
5	50	\$16.32	\$13.00	\$11.02	\$0.00	\$40.34
6	55	\$17.95	\$13.00	\$11.27	\$0.00	\$42.22
7	60	\$19.58	\$13.00	\$11.52	\$0.00	\$44.10
8	65	\$21.22	\$13.00	\$11.77	\$0.00	\$45.99
9	70	\$22.85	\$13.00	\$12.02	\$0.00	\$47.87
10	75	\$24.48	\$13.00	\$12.26	\$0.00	\$49.74

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	\$13.26	\$13.00	\$0.40	\$0.00	\$26.66
2	40	\$13.26	\$13.00	\$0.40	\$0.00	\$26.66
3	45	\$14.92	\$13.00	\$9.79	\$0.00	\$37.71
4	45	\$14.92	\$13.00	\$9.79	\$0.00	\$37.71
5	50	\$16.58	\$13.00	\$10.04	\$0.00	\$39.62
6	55	\$18.23	\$13.00	\$10.29	\$0.00	\$41.52
7	60	\$19.89	\$13.00	\$10.54	\$0.00	\$43.43
8	65	\$21.55	\$13.00	\$10.79	\$0.00	\$45.34
9	70	\$23.21	\$13.00	\$11.04	\$0.00	\$47.25
10	75	\$24.86	\$13.00	\$11.29	\$0.00	\$49.15

Notes:

Apprentice to Journeyworker Ratio:1:1

TERRAZZO FINISHERS	02/01/2013	\$46.35	\$10.18	\$17.83	\$0.00	\$74.36
BRICKLAYERS LOCAL 3 - MARBLE & TILE	08/01/2013	\$47.25	\$10.18	\$17.90	\$0.00	\$75.33
	02/01/2014	\$47.81	\$10.18	\$17.90	\$0.00	\$75.89
	08/01/2014	\$48.71	\$10.18	\$17.97	\$0.00	\$76.86
	02/01/2015	\$49.27	\$10.18	\$17.97	\$0.00	\$77.42
	08/01/2015	\$50.17	\$10.18	\$18.04	\$0.00	\$78.39
	02/01/2016	\$50.74	\$10.18	\$18.04	\$0.00	\$78.96
	08/01/2016	\$51.64	\$10.18	\$18.12	\$0.00	\$79.94
	02/01/2017	\$52.21	\$10.18	\$18.12	\$0.00	\$80.51

Classification

Effective Date Base Wage Health Pension Supplemental Unemployment Total Rate

Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effective Date - 02/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.18	\$10.18	\$17.83	\$0.00	\$51.19
2	60	\$27.81	\$10.18	\$17.83	\$0.00	\$55.82
3	70	\$32.45	\$10.18	\$17.83	\$0.00	\$60.46
4	80	\$37.08	\$10.18	\$17.83	\$0.00	\$65.09
5	90	\$41.72	\$10.18	\$17.83	\$0.00	\$69.73

Effective Date - 08/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	\$23.63	\$10.18	\$17.90	\$0.00	\$51.71
2	60	\$28.35	\$10.18	\$17.90	\$0.00	\$56.43
3	70	\$33.08	\$10.18	\$17.90	\$0.00	\$61.16
4	80	\$37.80	\$10.18	\$17.90	\$0.00	\$65.88
5	90	\$42.53	\$10.18	\$17.90	\$0.00	\$70.61

Notes:

Apprentice to Journeyworker Ratio:1:3

TEST BORING DRILLER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2012	\$37.30	\$7.10	\$12.60	\$0.00	\$57.00
	06/01/2013	\$34.45	\$7.10	\$12.60	\$0.00	\$54.15
	12/01/2013	\$35.20	\$7.10	\$12.60	\$0.00	\$54.90
	06/01/2014	\$35.95	\$7.10	\$12.60	\$0.00	\$55.65
	12/01/2014	\$36.70	\$7.10	\$12.60	\$0.00	\$56.40
	06/01/2015	\$37.45	\$7.10	\$12.60	\$0.00	\$57.15
	12/01/2015	\$38.20	\$7.10	\$12.60	\$0.00	\$57.90
	06/01/2016	\$38.95	\$7.10	\$12.60	\$0.00	\$58.65
	12/01/2016	\$39.95	\$7.10	\$12.60	\$0.00	\$59.65

For apprentice rates see "Apprentice- LABORER"

TEST BORING DRILLER HELPER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2012	\$32.42	\$7.10	\$12.60	\$0.00	\$52.12
	06/01/2013	\$33.17	\$7.10	\$12.60	\$0.00	\$52.87
	12/01/2013	\$33.92	\$7.10	\$12.60	\$0.00	\$53.62
	06/01/2014	\$34.67	\$7.10	\$12.60	\$0.00	\$54.37
	12/01/2014	\$35.42	\$7.10	\$12.60	\$0.00	\$55.12
	06/01/2015	\$36.17	\$7.10	\$12.60	\$0.00	\$55.87
	12/01/2015	\$36.92	\$7.10	\$12.60	\$0.00	\$56.62
	06/01/2016	\$37.67	\$7.10	\$12.60	\$0.00	\$57.37
	12/01/2016	\$38.67	\$7.10	\$12.60	\$0.00	\$58.37

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING LABORER <i>LABORERS - FOUNDATION AND MARINE</i>	12/01/2012	\$32.30	\$7.10	\$12.60	\$0.00	\$52.00
	06/01/2013	\$33.05	\$7.10	\$12.60	\$0.00	\$52.75
	12/01/2013	\$33.80	\$7.10	\$12.60	\$0.00	\$53.50
	06/01/2014	\$34.55	\$7.10	\$12.60	\$0.00	\$54.25
	12/01/2014	\$35.30	\$7.10	\$12.60	\$0.00	\$55.00
	06/01/2015	\$36.05	\$7.10	\$12.60	\$0.00	\$55.75
	12/01/2015	\$36.80	\$7.10	\$12.60	\$0.00	\$56.50
	06/01/2016	\$37.55	\$7.10	\$12.60	\$0.00	\$57.25
	12/01/2016	\$38.55	\$7.10	\$12.60	\$0.00	\$58.25
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$39.72	\$10.00	\$13.02	\$0.00	\$62.74
	06/01/2013	\$40.49	\$10.00	\$13.02	\$0.00	\$63.51
	12/01/2013	\$41.27	\$10.00	\$13.02	\$0.00	\$64.29
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$32.42	\$9.07	\$8.00	\$0.00	\$49.49
TUNNEL WORK - COMPRESSED AIR <i>LABORERS (COMPRESSED AIR)</i>	12/01/2012	\$44.58	\$7.10	\$13.00	\$0.00	\$64.68
	06/01/2013	\$45.33	\$7.10	\$13.00	\$0.00	\$65.43
	12/01/2013	\$46.08	\$7.10	\$13.00	\$0.00	\$66.18
	06/01/2014	\$46.83	\$7.10	\$13.00	\$0.00	\$66.93
	12/01/2014	\$47.58	\$7.10	\$13.00	\$0.00	\$67.68
	06/01/2015	\$48.33	\$7.10	\$13.00	\$0.00	\$68.43
	12/01/2015	\$49.08	\$7.10	\$13.00	\$0.00	\$69.18
	06/01/2016	\$49.83	\$7.10	\$13.00	\$0.00	\$69.93
	12/01/2016	\$50.83	\$7.10	\$13.00	\$0.00	\$70.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) <i>LABORERS (COMPRESSED AIR)</i>	12/01/2012	\$46.58	\$7.10	\$13.00	\$0.00	\$66.68
	06/01/2013	\$47.33	\$7.10	\$13.00	\$0.00	\$67.43
	12/01/2013	\$48.08	\$7.10	\$13.00	\$0.00	\$68.18
	06/01/2014	\$48.83	\$7.10	\$13.00	\$0.00	\$68.93
	12/01/2014	\$49.58	\$7.10	\$13.00	\$0.00	\$69.68
	06/01/2015	\$50.33	\$7.10	\$13.00	\$0.00	\$70.43
	12/01/2015	\$51.08	\$7.10	\$13.00	\$0.00	\$71.18
	06/01/2016	\$51.83	\$7.10	\$13.00	\$0.00	\$71.93
	12/01/2016	\$52.83	\$7.10	\$13.00	\$0.00	\$72.93
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2012	\$36.65	\$7.10	\$13.00	\$0.00	\$56.75
	06/01/2013	\$37.40	\$7.10	\$13.00	\$0.00	\$57.50
	12/01/2013	\$38.15	\$7.10	\$13.00	\$0.00	\$58.25
	06/01/2014	\$38.90	\$7.10	\$13.00	\$0.00	\$59.00
	12/01/2014	\$39.65	\$7.10	\$13.00	\$0.00	\$59.75
	06/01/2015	\$40.40	\$7.10	\$13.00	\$0.00	\$60.50
	12/01/2015	\$41.15	\$7.10	\$13.00	\$0.00	\$61.25
	06/01/2016	\$41.90	\$7.10	\$13.00	\$0.00	\$62.00
	12/01/2016	\$42.90	\$7.10	\$13.00	\$0.00	\$63.00
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - FREE AIR (HAZ. WASTE) <i>LABORERS (FREE AIR TUNNEL)</i>	12/01/2012	\$38.65	\$7.10	\$13.00	\$0.00	\$58.75
	06/01/2013	\$39.40	\$7.10	\$13.00	\$0.00	\$59.50
	12/01/2013	\$40.15	\$7.10	\$13.00	\$0.00	\$60.25
	06/01/2014	\$40.90	\$7.10	\$13.00	\$0.00	\$61.00
	12/01/2014	\$41.65	\$7.10	\$13.00	\$0.00	\$61.75
	06/01/2015	\$42.40	\$7.10	\$13.00	\$0.00	\$62.50
	12/01/2015	\$43.15	\$7.10	\$13.00	\$0.00	\$63.25
	06/01/2016	\$43.90	\$7.10	\$13.00	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL <i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>	12/01/2012	\$31.84	\$8.91	\$8.00	\$0.00	\$48.75
WAGON DRILL OPERATOR <i>LABORERS - ZONE 1</i>	12/01/2012	\$32.55	\$7.10	\$12.45	\$0.00	\$52.10
	06/01/2013	\$33.30	\$7.10	\$12.45	\$0.00	\$52.85
	12/01/2013	\$34.05	\$7.10	\$12.45	\$0.00	\$53.60
	06/01/2014	\$34.80	\$7.10	\$12.45	\$0.00	\$54.35
	12/01/2014	\$35.55	\$7.10	\$12.45	\$0.00	\$55.10
	06/01/2015	\$36.30	\$7.10	\$12.45	\$0.00	\$55.85
	12/01/2015	\$37.05	\$7.10	\$12.45	\$0.00	\$56.60
	06/01/2016	\$37.80	\$7.10	\$12.45	\$0.00	\$57.35
For apprentice rates see "Apprentice- LABORER"						
WASTE WATER PUMP OPERATOR <i>OPERATING ENGINEERS LOCAL 4</i>	12/01/2012	\$40.09	\$10.00	\$13.02	\$0.00	\$63.11
	06/01/2013	\$40.87	\$10.00	\$13.02	\$0.00	\$63.89
	12/01/2013	\$41.65	\$10.00	\$13.02	\$0.00	\$64.67
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER <i>PLUMBERS & GASFITTERS LOCAL 12</i>	03/01/2013	\$49.31	\$9.32	\$13.29	\$0.00	\$71.92
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$25.18	\$8.20	\$4.17	\$0.00	\$37.55
	09/01/2013	\$25.66	\$8.70	\$4.48	\$0.00	\$38.84
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$35.67	\$8.20	\$4.98	\$0.00	\$48.85
	09/01/2013	\$36.55	\$8.70	\$6.58	\$0.00	\$51.83
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$29.38	\$8.20	\$5.68	\$0.00	\$43.26
	09/01/2013	\$29.94	\$8.70	\$6.05	\$0.00	\$44.69
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$23.08	\$8.20	\$3.94	\$0.00	\$35.22
	09/01/2013	\$23.52	\$8.70	\$5.24	\$0.00	\$37.46
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class A CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$35.67	\$8.20	\$8.98	\$0.00	\$52.85
	09/01/2013	\$36.35	\$8.70	\$9.43	\$0.00	\$54.48
For apprentice rates see "Apprentice- LINEMAN"						
EQUIPMENT OPERATOR (Class B CDL) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$31.48	\$8.20	\$6.19	\$0.00	\$45.87
	09/01/2013	\$32.08	\$8.70	\$6.59	\$0.00	\$47.37
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$23.08	\$8.20	\$3.42	\$0.00	\$34.70
	09/01/2013	\$23.52	\$8.70	\$3.72	\$0.00	\$35.94
For apprentice rates see "Apprentice- LINEMAN"						
GROUNDMAN -Inexperienced (<2000 Hrs.) <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$18.89	\$8.20	\$2.61	\$0.00	\$29.70
	09/01/2013	\$19.25	\$8.70	\$2.85	\$0.00	\$30.80
For apprentice rates see "Apprentice- LINEMAN"						
JOURNEYMAN LINEMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	03/03/2013	\$41.97	\$8.20	\$11.26	\$0.00	\$61.43
	09/01/2013	\$42.77	\$8.70	\$11.78	\$0.00	\$63.25

Apprentice - LINEMAN (Outside Electrical) - East Local 104

Effective Date - 03/03/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$25.18	\$8.20	\$3.92	\$0.00	\$37.30
2	65	\$27.28	\$8.20	\$4.36	\$0.00	\$39.84
3	70	\$29.38	\$8.20	\$5.06	\$0.00	\$42.64
4	75	\$31.48	\$8.20	\$5.76	\$0.00	\$45.44
5	80	\$33.58	\$8.20	\$6.46	\$0.00	\$48.24
6	85	\$35.67	\$8.20	\$7.17	\$0.00	\$51.04
7	90	\$37.77	\$8.20	\$8.36	\$0.00	\$54.33

Effective Date - 09/01/2013

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	\$25.66	\$8.70	\$4.24	\$0.00	\$38.60
2	65	\$27.80	\$8.70	\$4.71	\$0.00	\$41.21
3	70	\$29.94	\$8.70	\$5.43	\$0.00	\$44.07
4	75	\$32.08	\$8.70	\$6.16	\$0.00	\$46.94
5	80	\$34.22	\$8.70	\$6.88	\$0.00	\$49.80
6	85	\$36.35	\$8.70	\$7.62	\$0.00	\$52.67
7	90	\$38.49	\$8.70	\$8.83	\$0.00	\$56.02

Notes:

Apprentice to Journeyworker Ratio:1:2

TELEDATA CABLE SPLICER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/16/2012	\$26.33	\$4.18	\$2.79	\$0.00	\$33.30
TELEDATA LINEMAN/EQUIPMENT OPERATOR <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/16/2012	\$24.78	\$4.18	\$2.74	\$0.00	\$31.70
TELEDATA WIREMAN/INSTALLER/TECHNICIAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	07/16/2012	\$24.78	\$4.18	\$2.74	\$0.00	\$31.70
TREE TRIMMER <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/01/2009	\$16.59	\$2.42	\$0.00	\$0.00	\$19.01
This classification applies only to the trimming of branches on and around utility lines.						
TREE TRIMMER GROUNDMAN <i>OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104</i>	02/01/2009	\$14.64	\$2.42	\$0.00	\$0.00	\$17.06
This classification applies only to the trimming of branches on and around utility lines.						

Additional Apprentices Information:

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

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

All steps are six months (1000 hours) unless otherwise specified.

* Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof.

** Multiple ratios are listed in the comment field.

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

**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

DOCUMENT 00 41 00: FORM FOR GENERAL BID

PLACE _____ DATE _____

PROPOSAL OF: _____ (hereinafter called "Bidder")

a _____ corporation/a partnership/an
(State)
individual doing business as _____

To the Town of Arlington (hereinafter called "Owner")
Sir:

- A. The Bidder in compliance with your Invitation to Bid for 6th Floor Arlington High School Renovations Office of the Superintendent Arlington, MA, prepared by Turowski 2 Architecture, Inc, P.O. Box 1290, 313 Wareham Road, MA, 02738, having examined the Plans and Specifications with related documents and the site of the proposed work, and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials and supplies; and to construct the project in accordance with the Contract Documents, and at the price stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

Bidder hereby agrees to commence work under this Contract on or before a date to be specified in written "Notice to Proceed" of the Owner and to fully complete the project on or before the days specified in the "Instructions to Bidders". Bidder further agrees to pay as liquidated damages the sum of \$200.00 for each consecutive calendar day thereafter as hereinafter provided in the General Conditions.

- B. Bidder Acknowledges receipt of the following addendum:

- C. Base Proposal: Bidder agrees to perform all of the

_____ work
described in the Specifications and shown on the Plans (total of Items 1 and 2 below) for the sum of:

_____ (\$ _____)

(Amounts Shall be Shown in Both Words and Figures)

In case of discrepancy, the amount shown in figures shall govern.

Item No.1: Removal and Disposal of Vinyl Asbestos Flooring in Quantities Greater Than Indicated on Drawings Including Replacement with New Resilient Flooring

\$ _____ per square foot

Item No. 2 – Construction of Mini-containment < 10SF

\$ _____ per containment

Item No. 3 – Duplex Electrical Outlets

\$ _____ per duplex outlet

Item No. 4 – Duplex Data Outlet Infrastructure

\$ _____ per back box

- G. The Undersigned agrees that if selected as General Contractor, we will within seven days, Saturdays, Sundays and Legal Holidays excluded, after presentation thereof by the Awarding Authority, execute a Contract in accordance with the terms of this Bid and furnish a Performance Bond and also a Labor and Materials Payment Bond, each of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Awarding Authority, in the full sum of the contract price.
- H. The Undersigned hereby certifies that they are able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the Work and that they will comply fully with all laws and regulations applicable to awards made subject to Section Forty Four A.
- I. Bidder understands that the Owner reserves the right to reject any of all bids or waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 60 calendar days after the scheduled closing time for receiving bids.

Upon receipt of Written Notice of Acceptance of this Bid, Bidder will execute the formal contract attached within 10 days and deliver a Surety Bond or Bonds required by the General Conditions.

The Bid Security attached in the sum of: _____ (\$ _____) is to become the property of the Owner if the Contract and Bond are not executed within the time above set forth, as liquid damages for the delay and additional expense to the Owner caused thereby.

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

Name of General Bidder

By _____
Name and Title of Person Signing Bid

Business Address/City and State

Date

NOTE: If the Bidder is a corporation, indicate state of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential address if different from business address.

L. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.

1. Have been in business under the present business name _____ years.
2. Ever failed to complete any work awarded? _____ If yes, explain.
3. List of similar projects, remaining open and in operation during the course of construction, completed within the past five (5) years.

	<u>NAME OF BUILDING</u>	<u>OWNER</u>	<u>AMOUNT OF CONTRACT</u>
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____
d.	Bank Reference: _____		

M. Include, on a separate sheet, list of officers of firm and key personnel, together with their qualifications.

"The bidder hereby certifies he shall comply with the minority manpower ratio and specific action steps contained in the Supplemental Equal-Employment Opportunity Anti-Discrimination and Affirmative Action Plan (Supplemental EEO) attached hereto, including compliance with the minority contractor compliance specified therein."

(Name of General Bidder)

By: _____

(Business Address)

(City, State and Zip Code)

Date: _____

CERTIFICATION OF PAYMENT OF STATE TAXES

Legislation enacted by the Commonwealth of Massachusetts, effective July 1, 1983, requires that the attestation below be signed:

Pursuant to M.G.L. Ch. 62C, Sec. 49A, I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

Social Security Number
Federal Identification Number

Signature of Individual or

Corporate Name

END OF DOCUMENT

DOCUMENT 00 41 02: FORM FOR FILED SUB-BID

TO: All General Bidders except those excluded:

- A. The undersigned proposes to furnish all labor and materials required for completing, in accordance with the Drawings, Specifications and Addenda, all work specified for _____ Trade, as specified under the following Section(s) _____

of the Contract Documents, Specifications and any Drawings specified under such Sections, prepared by Turowski 2 Architecture, Inc, P.O. Box 1290, 313 Wareham Road, Marion, MA, 02738 for 6th Floor Office Renovation, Arlington High School, Arlington, MA for the Contract Sum of:

_____ Dollars

(Total Sub-Bid Price Amount in Words)

(\$ _____)
(Total Sub-Bid Price Amount in Numbers)

- B. Addenda: This Sub-Bid includes the following addenda:

(____) (____) (____) (____)
(Indicate Addendum Numbers Received)

- C. Alternates: The following alternate prices are to be added to or subtracted from the above stated Sub-Bid Proposal. (In the event that an alternate does not affect the Contract Price, the Sub-Bidder shall remark "No Change".)

DEDUCT

For Alternate No. 1:

"Eliminate Work Associated With Creating Rooms 608c and 609c and All Sprinkler Modifications" \$ _____

For Alternate No. 2:

"Eliminate Roof Top Unit and Modify Associated Work" \$ _____

- D. Restrictions: The following restrictions are placed on this proposal. This sub-bid may be used by any General Bidder except the following:

This sub-bid may be used by only the following General Bidders:

Note: To exclude General Bidders, insert "X" in one box only, and fill in blanks following that box. Do not answer "D" if General Bidders are not excluded).

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

Class of Work and Sub-Sub-Bidder Name [Description]	Amount
_____	\$ _____
[Description]	
_____	\$ _____
[Description]	
_____	\$ _____

(Do not give bid price for any class or part thereof furnished by the undersigned.)
The undersigned agrees that the above list of sub-sub-bids to the undersigned represents bona fide bids based on hereinbefore described Drawings, Specifications and Addenda and that, if the undersigned is awarded the contract, they will be used for the Work indicated at the amounts stated, if satisfactory to the Awarding Authority.

F. ITEM UNIT ADD/ DEDUCT

Unit Prices for material identified or discovered prior to or during work which is not in Base Bid. Unit prices include labor, disposal, and all necessary fees. The same unit price shall apply whether the work is added or deducted. Refer to Section 012200 – UNIT PRICES

Item No.1: Removal and Disposal of Vinyl Asbestos Floor Tile and Replace with New VCT

\$ _____ per square foot

Item No. 2 –Construction of Mini-containment < 10SF

\$ _____ per containment

Item No. 3– Duplex Electrical Outlets

\$ _____ per duplex outlet

Item No. 4– Duplex Data Outlet Infrastructure

\$ _____ per back box

- G. Contract: The undersigned agrees that, if he is selected as Sub-Bidder, he will within five (5) days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the Sub-Contract to the General Bidder selected as the General Contractor, execute with such General Bidder a Sub-Contract in accordance with the terms of this Sub-Bid and contingent upon the execution of the General contract, and, if requested so to do in the general bid by such General Bidder who shall pay the premiums therefore, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Awarding Authority and each in full sum of the subcontract price.

The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore described plans and specifications, (including all general conditions stated therein) and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the Awarding Authority.

- H. Examined Conditions: The undersigned Sub-Bidder hereby declares that he or she has visited the site and the conditions present and has carefully examined the Contract Documents, together with all Addenda issued, received and acknowledged below, and has familiarized himself or herself with the legal requirements (federal, state, and local laws, ordinances, rules and regulations) and other conditions which may affect the cost, progress or performance of Work, and has made independent investigations, deemed necessary by the Sub-Bidder.
- I. Certification of Unbiased Bidding: The undersigned also hereby certify under the penalties of perjury that they are the only persons interested in this proposal, that no person acting for, or employed by, the Awarding Authority is directly or indirectly interested in this proposal, or in any contract which be made under it, or in expected profits to arise therefrom; and without directly or indirectly influencing or attempting to influence any other person or corporation to bid or to refrain from bidding or to influence the amount of the bid of any other person or corporation. The undersigned further declares that in regard to the conditions affecting the work to be done and the labor and materials needed, this proposal is based solely on their own investigation and research and not in reliance upon any representation of any employee, officer or agent of the Awarding Authority.
- J. Withdraw bids: The Sub-Bidder agrees that this Bid shall be good and may not be withdrawn for a period of 30 calendar days after the scheduled closing time for receipt of bids.
- K. Authority Rights: The Sub-Bidder understands the Awarding Authority right to reject any and all Bids.
1. Should the Invitation to Bid, Instructions to Bidders, Form for General Bid, Conditions of the Contract, Plans or Specifications require submission of special data to accompany the bid, the Awarding Authority reserves the right to rule the sub-

bidder's failure to submit such data an informality and to receive said data subsequently, within a reasonable time as set by the Awarding Authority.

- L. Qualifications: The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all requirements of the plans and specifications.
1. Have been in business under present business name _____ years.
 2. Ever failed to complete any work awarded? yes / no
(if yes, attach a full description of the circumstances)
 3. Attach a list three or more recent buildings with names of General Contractor and Architect on which you served as subcontractor for work of similar character as required for the above named building. Provide the cost of the sub-contract for each project listed.
 4. Bank References:

- M. Furnish Labor: The undersigned hereby certifies that he/she is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and he/she will comply fully with all laws and regulations applicable to awards made subject to Massachusetts General Laws (MGL) Chapter 149, Section 44A.
- N. Non-collusion: The undersigned Bidder certifies under the penalty of perjury, that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection, the word "person" shall mean natural person, joint venture, partnership, corporation, or other business, or legal entity.
- O. Affidavit of eligibility to perform work in the Commonwealth of Massachusetts: The undersigned certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Section 29F of Chapter 29, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated hereunder.

Date of Bid: _____

(Name of Bidder - Company Name)

BY _____

(SIGNATURE of Person Signing Bid and Title)

(PRINTED Name of Person Signing Bid and Title)

(Business Mailing Address)

(City/Town, State and Zip Code)

Corporate Seal

(Business Telephone Number)

Note: If the bidder is a corporation, indicate state of incorporation under signature and affix corporate seal; if partnership, give full names and residential address of all partners; and if an individual give residential address if different from business address.

END OF DOCUMENT

DOCUMENT 00 43 01: NON-COLLUSION AFFIDAVIT

State of _____)

County of _____)

_____, being first duly sworn,
(Name of Affiant)

deposes and says that:

- (1) He is _____ of _____, the Bidder that has submitted the attached Bid;
- (2) He is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid;
- (3) Such Bid is genuine and is not a collusive or sham Bid;
- (4) Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with any other Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached Bid has been submitted or to refrain from bidding in connection with such Contract, or has in any manner, directly or indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to fix the price or prices in the attached Bid or of any other Bidder, or to fix any overhead, profit or cost element of the Bid price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful agreement any advantage against the Town of Arlington, Massachusetts, or any person interested in the proposed Contract; and
- (5) The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion, conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agent, representatives, owners, employees, or parties in interest, including this affiant.

Signed _____

Subscribed and sworn to me

this _____ day of _____, 20____.

(Title)

My commission expires _____

END OF DOCUMENT

DOCUMENT 00 43 02: CERTIFICATE OF VOTE

I, _____, Clerk of
_____, hereby certify
that, at a meeting of the Board of Directors of said Corporation duly held on
_____20_____, at which a quorum

(DATE MUST BE EARLIER THAN DATE OF CONTRACT)

was present and voting throughout, the following vote was duly passed and is now in full force and effect:

"VOTED: That _____
(Name of Officer authorized to sign for Corp.)

be and be hereby is authorized, directed and empowered for, in the name and on behalf of this Corporation, to sign, seal with the corporate seal, execute, acknowledge and deliver all contracts, bonds and other obligations by such

_____ to be valid and binding upon this
(Name of Officer)

Corporation for all purposes, and that a certificate of the Clerk of the Corporation setting forth this vote shall be delivered to the _____ and that this vote shall remain in full force and effect unless and until the same has been altered, amended or revoked by a subsequent vote of such directors and a certificate of such later vote attested by the Clerk of this Corporation is delivered to the

(Name of Officer)

I further certify that _____
(Name of Officer)

is duly elected _____ of said Corporation.
(Title)

Signed _____
(Clerk-Secretary)

Place of Business _____

Date of Contract _____

AFFIX CORPORATE SEAL

COUNTERSIGNATURE: _____
(Name and Title of Officer)

In the event that the Clerk or Secretary is the same person as the Officer authorized to sign that contract or other instrument for the Corporation, this certificate must be countersigned by another officer of the Corporation.

END OF DOCUMENT

DOCUMENT 00 43 03: STATEMENT OF STATE TAX COMPLIANCE

Pursuant to Chapter 62C of Massachusetts General Laws, Section 49A (b), I,

.....
(Name and Title)

authorized signatory for:
(Contracting Party)

whose principal place of business is at
(Street Address)

....., do hereby
(City/Town, State)

certify under the pains and penalties of perjury that

..... has complied
(Contracting Party)

with all laws of the Commonwealth of Massachusetts relating to taxes.

Date:

.....
{Authorized Signature}

END OF DOCUMENT

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

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: Consolidated General Conditions and Supplemental Statutory Conditions
- Fifth Priority: Drawings and Specifications

Any references throughout the contract documents to "General Conditions" or "Supplementary General Conditions" are deleted and "Consolidated General Conditions and Supplemental Statutory Conditions" is substituted therefore. All bidders and sub-bidders take note that the Town has consolidated 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, 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 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 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.

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.

2.1.2 The Project Engineer is the person or entity identified as such in writing by the Owner. The Project Engineer shall act as the Owner's representative with respect to all matters pertaining to the Project. The duties, responsibilities, and obligations of the Project Engineer 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 Engineer, 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 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 the date of final payment under this Contract and, 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 Contract 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 waives all of the Town's building, plumbing, gas, electrical, and other applicable inspection fees of the Town associated with the Work.

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

3.8.2 Unless otherwise provided in the Contract Documents:

1. materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay in the Work;
2. allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
3. Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances;
4. whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.2 and (2) changes in Contractor's costs under Clause 3.8.2.3.

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 in accordance with Article 15 of the By-Laws of the Town of Arlington. 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 liquidation 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 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 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 shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

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

3.15 CLEANING UP

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

3.16 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 AND COVENANT NOT TO SUE

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, provided such instructions or directions are the primary cause of the injury or damage.

3.18.4 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 this Paragraph 3.18, the Architect agrees 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 this Paragraph 3.18; 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.

3.19 RECORD KEEPING REQUIREMENTS

3.19.1 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.

4.1.3 In case of termination of employment of the Architect, the Owner shall appoint an architect against whom the Contractor makes no reasonable objection and whose status under the Contract Documents shall be that of the former architect.

4.2 ARCHITECT'S ADMINISTRATION
OF THE CONTRACT

4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents. 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. However, 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 Engineer. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

4.2.5 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 The Architect will review and take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with reasonable promptness, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of 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, 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" also includes 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 30 days after occurrence of the event giving rise to such Claim or within 30 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 If adverse weather conditions are the basis for a Claim for additional time or cost, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction.

4.3.8 Injury or Damage to Person or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, 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 has been resolved, the Architect will prepare or obtain appropriate documentation.

4.4.3 If a Claim has not been resolved, the party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

4.4.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

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. If the neutral arbitrator is 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 is not appointed by the American Arbitration Association, then the panel of arbitrators 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.

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 therefore.

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.

8.3 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.

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 rate of three percentage points above 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 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, 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.

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.

9.7 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 or designated portion thereof 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 as 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.

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 - \$2,000,000;

Disease - policy limit \$2,000,000;

Disease - each employee \$2,000,000.

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:

\$5,000,000 - general aggregate;

\$2,000,000 - products/completed operations aggregate;

\$2,000,000 - personal injury and advertising;

\$2,000,000 - each occurrence.

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

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 If the property insurance requires a minimum deductible, the Contractor shall bear the cost not covered because of such deductible. If the Owner elects to accept a voluntary deductible in excess of the minimum deductible, the Owner shall bear the cost not covered by such excess deductible amount, except as provided in Subparagraph 10.2.5.

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. The Owner and Contractor waive all rights against (1) each other and any of their Subcontractors, Sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their Subcontractors, Sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Paragraph 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the Subcontractors, Sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

11.3.8 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Subparagraph 11.3.10. 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 as fiduciary 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 as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in Paragraph 4.5.

11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection be made, arbitrators shall be chosen as provided in Paragraph 4.5. The Owner as fiduciary 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;
- .2 an act of government, such as declaration of national emergency, making material unavailable; or
- .3 because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Subparagraph 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents.

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 substantial violation of any provision of 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.

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.

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 _____, 20

I,
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by (Contractor, Subcontractor or public body) ___ 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.

DOCUMENT 00 72 10: FORM OF CONTRACTOR'S
EQUAL EMPLOYMENT CERTIFICATION

This form must be completed and submitted by the Contractor prior to the signing of the Owner/Contractor Agreement.

(Name and Address of Contractor)

certifies that it:

1. Intends to use the following listed construction trades in the work under this contract:

2. Will comply with the minority manpower ratio and specific affirmative action steps contained herein; and
3. Will obtain from each of its subcontractors and submit to the Authority prior to the award of any subcontract under this contract the subcontractors' certification.

(Signature of authorized representative of contractor)

Date _____ Name and Title _____

END OF DOCUMENT

DOCUMENT 00 72 11: FORM OF SUBCONTRACTOR'S
EQUAL EMPLOYMENT CERTIFICATION

This form must be completed and submitted by the Subcontractor prior to the signing of the Owner-Contractor Agreement.

(Name and Address of Subcontractor)

This certifies that it:

1. intends to use the following listed construction trades in the work under the subcontract:

2. will comply with the minority manpower ratio and specific affirmative action steps contained herein; and

3. will obtain from each of the sub-subcontractors, prior to the award of any sub-subcontract under this subcontract, sub-subcontractor's certification.

(Signature of authorized representative of Subcontractor)

Date _____ Name and Title _____

END OF DOCUMENT

ATTACHMENT A Not included
ATTACHMENT B

PROCEDURE FOR PRE-BID REDUCTION/WAIVER OF MBE/WBE PARTICIPATION GOALS¹

I. Pre-Bid Reduction/Waiver Procedures

A. Affirmative Marketing Participation Goals

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

Design Participation: MBEs (8%) and WBEs (4%)
Construction Participation: MBEs (7.4%) and WBEs (4%)

B. Criteria for Reduction/Waiver of Goals

Potential Bidders may request a reduction or waiver of goals on a project-by-project basis before bids are submitted. The Awarding Authority reserves the right to reduce or waive the MBE or WBE design and construction participation goals established for this Contract upon written request made by a general Bidder. In accordance with Section 7 of Chapter 193 of the Acts of 2004, such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non-MBE or non-WBE general Bidder to meet the goals based upon a showing that good faith efforts have been made to comply with the participation goals. Factors that may be considered in granting a reduction or waiver of the contract goals include any or all of the following:

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

C. Supporting Documentation Required from Potential Construction Bidders

1. A list of all items of work under the Contract that the Bidder made available for subcontracting to MBE/WBEs. The Bidder shall identify all items of work, other than work to be performed by filed sub-Bidders, that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to MBE/WBEs. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into scopes or tasks capable of being performed by MBE/WBEs.
2. Documentation that the Bidder sent written notices soliciting Bids or proposals to perform the items of work made available by the Bidder for subcontracting to MBE/WBEs to all MBE/WBEs qualified to perform such work. The Bidder shall identify (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SOMWBA directory under the applicable trade category that was not solicited and reasons therefore. The Bidder shall also state the date that notices were mailed and provide a copy of the written notice(s) sent.

¹ See Model Bidding Instructions

See Model Contract Instructions

3. Documentation that the Bidder made reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted.
4. A statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a bid or proposal.
5. Documentation of reasonable efforts, if any, made to assist MBE/WBEs that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of MBE/WBEs to obtain bonding, insurance, or lines of credit is the reason given for the Bidder's inability to meet the MBE/WBE goals.
6. The Bidder may also submit any other information supporting its request for a waiver or reduction in the MBE/WBE participation goals, including without limitation evidence that the Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from MBE/WBEs, and/or sent written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the Contract and the work to be subcontracted by the Bidder to MBE/WBEs. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all actions that could reasonably be expected to achieve the MBE/WBE participation goals.

D. Process for Requesting Waiver/Reduction of Construction Goals

1. Requests from prospective general Bidders to reduce or waive the MBE/WBE participation goals for the Contract must be received by the Awarding Authority no later than ten (10) working days before the general bids are due.
2. The Awarding Authority shall not consider any request to reduce or waive the MBE/WBE Participation goals for the Contract that is received after the aforementioned deadlines. Any reduction or waiver of the MBE/WBE participation goals for the Contract will be made by written addendum mailed to all persons who have taken out plans for the project within a reasonable period prior to bid submission.
3. Procedures and Timelines for the Waiver/Reduction of Construction Goals can be found in the attached Model Bidding Instructions.

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ATTACHMENT C

**MUNICIPAL CONTRACTS
STATE-ASSISTED BUILDING PROJECTS
MODEL BIDDING INSTRUCTIONS**

APPENDIX TO BIDDING INSTRUCTIONS

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

The applicable goals for minority business enterprise (MBE) and woman business enterprise (WBE) participation established for this Contract are as follows:

MBE: 7.4 % of the Contract Price. WBE: 4 % of the Contract Price.

A. MBE AND WBE PARTICIPATION

1. The apparent low Bidder's compliance with the requirements of this Section is a pre-requisite for receiving the Award of the Contract.
2. The MBE and WBE participation goals for this Contract are as set forth above. The Awarding Authority reserves the right to reduce or waive the MBE or WBE participation goals established for this Contract upon written request made by a general Bidder within the time frame set forth in paragraph 9 below. Such written request must demonstrate to the satisfaction of the Awarding Authority that it is not feasible for a non-MBE or non-WBE general Bidder to meet the goals established for this Contract based upon any or all of the following: (i) actual MBE/WBE availability, (ii) the geographic location of the project to the extent related to MBE/WBE availability, (iii) the scope of the work, (iv) the percentage of work available for subcontracting to MBE/WBEs and/or (v) other relevant factors, including a documented inability by the prospective Bidder to obtain commitments from MBE/WBE subcontractors sufficient to meet the MBE/WBE goals after having made a diligent, good faith effort to do so. All of the foregoing documentation shall accompany the Bidder's request for a reduction or waiver of the MBE/WBE participation goals. Such documentation shall include, at a minimum, the following:
 3. A list of all items of work under the Contract that the Bidder made available for subcontracting to MBE/WBEs. The Bidder shall identify all items of work, other than work to be performed by filed sub-Bidders, that the Bidder did not make so available and shall state the reasons for not making such work available for subcontracting to MBE/WBEs. The Bidder shall also demonstrate that, where commercially reasonable, subcontracts were divided into scopes or tasks capable of being performed by MBE/WBEs.
 4. Evidence that the Bidder sent written notices soliciting Bids or proposals to perform the items of work made available by the Bidder for subcontracting to all MBE/WBEs qualified to perform such work. The Bidder shall identify (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SOMWBA directory under the applicable trade category that was not solicited and reasons therefore. The Bidder shall also state the date that notices were mailed and provide a copy of the written notice(s) sent.
 5. Evidence that the Bidder made reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted.

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6. A statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a bid or proposal.
7. Evidence of reasonable efforts made, if any, to assist MBE/WBEs that needed assistance in obtaining bonding or insurance, or lines of credit with suppliers if the inability of MBE/WBEs to obtain bonding, insurance, or lines of credit is the reason given for the Bidder's inability to meet the MBE/WBE goals.
8. The Bidder may also submit any other information supporting its request for a waiver or reduction in the MBE/WBE participation goals, including without limitation evidence that the Bidder placed advertisements in appropriate media and trade association publications announcing the Bidder's interest in obtaining bids or proposals from MBE/WBEs, and/or sent written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the Contract and the work to be subcontracted by the Bidder to MBE/WBEs. The Bidder shall also submit any other information reasonably requested by the Awarding Authority to show that the Bidder has taken all actions that could reasonably be expected to achieve the MBE/WBE participation goals.
9. If **filed Sub-Bids** are solicited for this Contract, requests from prospective general Bidders to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority no later than five (5) working days after the list of filed sub-Bidders is mailed by the Awarding Authority to persons who have taken out plans for the Contract. If there are no filed sub-Bids solicited for this Contract, requests to reduce or waive the MBE/WBE participation goals for this Contract must be received by the Awarding Authority no later than ten (10) calendar days before the date set for the receipt of general Bids. **THE AWARDING AUTHORITY WILL NOT CONSIDER ANY REQUEST TO REDUCE OR WAIVE THE MBE/WBE PARTICIPATION GOALS FOR THIS CONTRACT THAT IS RECEIVED AFTER THESE DEADLINES. Any reduction or waiver of the MBE/WBE participation goals for this Contract will be made by written addendum mailed to all persons who have taken out plans for the project.**
10. No later than five (5) working days after the opening of general Bids, the apparent low Bidder shall submit the following documents to the Awarding Authority's Affirmative Marketing Construction Officer (AMCO): (i) a completed Schedule for Participation by MBE/WBE ("Schedule for Participation") in the form provided by the Awarding Authority showing MBE/WBE participation in amounts equal to or exceeding the MBE/WBE participation goals for this Contract, (ii) a completed Letter of Intent in the form provided by the Awarding Authority for each MBE/WBE listed in the Schedule for Participation, and (iii) a SOMWBA most recent certification letter for each MBE/WBE listed in the Schedule of MBE/WBE Participation showing that the MBE/WBE is certified in the area of work for which it is listed on the Letter of Intent.
11. Each Letter of Intent shall identify and describe the work to be performed by the named MBE/WBE (the "MBE/WBE Work") with enough specificity to permit the Awarding Authority to identify the particular items of contract work that the MBE/WBE will perform for MBE/WBE participation credit. The Awarding Authority reserves the right to reject any Letter of Intent if the price to be paid for the MBE/WBE Work does not bear a reasonable relationship to the value of such work under the Contract as determined by the Awarding Authority.
12. Within five (5) working days after receipt of the Schedule for MBE/WBE Participation, Letters of Intent, and SOMWBA most recent certification letter, the Awarding Authority shall review and either approve or disapprove the apparent low Bidder's submissions. If the apparent low Bidder has not submitted an appropriate Schedule for MBE/WBE Participation and appropriate Letters of Intent and SOMWBA most recent certification letter establishing that the MBE/WBE participation goal for the project will be met, the apparent low Bidder will be considered ineligible for Award of the Contract and the Awarding Authority will Award the Contract to the second lowest eligible and responsible Bidder, subject to said Bidder's compliance with these conditions. If funds are insufficient to award to the second lowest Bidder, the project may have to be re-bid.

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

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

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ATTACHMENT D

**MUNICIPAL CONTRACTS
STATE ASSISTED BUILDING PROJECTS
MODEL CONTRACT INSTRUCTIONS**

APPENDIX to General Conditions of the Contract

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

The applicable goals for minority business enterprise (MBE) and woman business enterprise (WBE) participation established for this Contract are as follows:

MBE: ____ % of the Contract Price. WBE: _____ % of the Contract Price.

1. Goals

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

2. MBE/WBE Participation Credit

- A. If the Contractor is itself an MBE or a WBE, MBE/WBE participation credit shall be given in an amount equal to the entire Contract Price. If the Contractor is not an MBE or WBE, then MBE/WBE participation credit will be given for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.
- B. If the Contractor is a joint venture with one or more MBE/WBE joint ventures, MBE/WBE participation credit shall be given to the joint venture as follows:
 - (1) If the joint venture is certified by SOMBWA as an MBE or WBE, MBE/WBE Participation credit shall be given in an amount equal to the entire Contract Price.
 - (2) If the joint venture is not certified as an MBE or WBE by SOMWBA, MBE/WBE participation credit shall be given to the joint venture for the value of the Work that is performed by the MBE/WBE joint venture(s), and for the value of the Work that is actually performed by each MBE or WBE subcontractor or sub-subcontractor.
- C. If an MBE/WBE supplies, but does not install equipment or materials, MBE/WBE participation credit shall be given only if the MBE/WBE supplier is regularly engaged in sales of equipment or supplies to the construction industry from an established place of business. MBE/WBE participation credit shall be given the full amount of the purchase order only if the MBE/WBE supplier manufactures the goods or substantially alters them before resale. Otherwise, a contractor may count toward its MBE/WBE goal 60 percent of the total bid price for its expenditures of its materials and supplies required under a contract and obtained from a MBE/WBE regular supplier.

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- D. MBE participation credit shall be given for the work performed by MBEs only, and WBE participation credit shall be given for the work performed by WBEs only. MBE participation may not be substituted for WBE participation, nor may WBE participation be substituted for MBE participation.

3. Establishing MBE/WBE Status.

- A. A minority owned business shall be considered as an MBE only if it has been certified as a minority business enterprise by the State Office of Minority and Women Business Assistance ("SOMWBA").
- B. A woman owned business shall be considered as a WBE only if it has been certified as a woman business enterprise by SOMWBA.
- C. Certification as a disadvantaged business enterprise ("DBE"), certification as MBE/WBE by any agency other than SOMWBA, or submission of an application to SOMWBA for certification as an MBE/WBE shall not confer MBE/WBE status on a firm for the purposes of this Contract.

4. Subcontracts with MBE/WBEs

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

5. Performance of Contract Work by MBE/WBEs

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

6. Notification of Changes in MBE/WBE Work

- A. If at any time during the performance of the Contract the Contractor determines or has reason to believe that a scheduled MBE/WBE is unable or unwilling to perform its MBE/WBE Work, or that there has been or

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will be a change in any MBE/WBE Work, or that the Contractor will be unable to meet the MBE/WBE participation goal(s) for this Contract for any reason, the Contractor shall immediately notify the Awarding Authority Contract Compliance Office in writing of such circumstances.

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

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

- A. In the event there is a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a Change Order initiated by the Awarding Authority, then the Contractor shall immediately undertake a diligent, good faith effort to make up the shortfall in MBE/WBE participation as follows:
- (1) The Contractor shall identify all items of the Work remaining to be performed under the Contract that may be made available for subcontracting to MBE/WBEs. The Contractor shall send a list of such items of work to the Awarding Authority, together with a list of the remaining items of the Work that was not made available to MBE/WBEs and the reason for not making such work available for subcontracting to MBE/WBEs.
 - (2) The Contractor shall send written notices soliciting proposals to perform the items of the Work that may be made available for subcontracting to MBE/WBEs to all MBE/WBEs qualified to perform such work. The Contractor shall advise the Awarding Authority of (i) each MBE/WBE solicited, and (ii) each MBE/WBE listed in the SOMWBA directory under the applicable trade category that was not solicited and the reasons therefore. The Contractor shall also advise the Awarding Authority of the dates notices were mailed and provide a copy of the written notice(s) sent.
 - (3) The Contractor shall make reasonable efforts to follow up the written notices sent to MBE/WBEs with telephone calls or personal visits in order to determine with certainty whether the MBE/WBEs were interested in performing the work. Phone logs or other documentation must be submitted to the Awarding Authority evidencing this effort.
 - (4) The Contractor shall make reasonable efforts to assist MBE/WBEs that need assistance in obtaining insurance, bonds, or lines of credit in order to perform work under the Contract, and shall provide the Awarding Authority with evidence that such efforts were made.
 - (5) The Contractor shall provide the Awarding Authority with a statement of the response received from each MBE/WBE solicited, including the reason for rejecting any MBE/WBE who submitted a proposal.
 - (6) The Contractor shall take any additional measures reasonably requested by the Awarding Authority to meet the MBE/WBE participation goal(s) established for this Contract, including, without limitation, placing advertisements in appropriate media and trade association publications announcing the Contractor's interest in obtaining proposals from MBE/WBEs, and/or sending written notification to MBE/WBE economic development assistance agencies, trade groups and other organizations notifying them of the project and of the work available to be subcontracted by the Contractor to MBE/WBEs.
- B. If the Contractor is unable to meet the MBE/WBE participation goals for this Contract after complying fully with each of the requirements of paragraph "A" above, and the Contractor is otherwise in full compliance with the terms of this Article, the Awarding Authority may reduce the MBE/WBE participation goals for this Contract to the extent that such goals cannot be achieved.

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

- A. If at any time during the performance of this Contract, the Awarding Authority determines or has reason to believe that (1) there has been a change or reduction in any MBE/WBE Work which will result in the Contractor failing to meet the MBE/WBE participation goal(s) for this Contract, other than a reduction in MBE/WBE Work resulting from a change in the Contract work ordered by the Awarding Authority, and (2) the Contractor has failed to comply fully with all of the terms and conditions of paragraphs 1 through 7 above, the Awarding Authority may:
- (1) Suspend payment to the Contractor of an amount equal to the value of the work which was to have been performed by an MBE/WBE pursuant to the Contractor's Schedule of MBE/WBE Participation but which was not so performed, in order to ensure that sufficient Contract funds will be available if liquidated damages are assessed pursuant to paragraph 9, and/or
 - (2) Suspend the Contractor's performance of this Contract in whole or in part.
- B. The Awarding Authority shall give the Contractor prompt written notice of any action taken pursuant to paragraph A above and shall give the Contractor and any other interested party, including any MBE/WBEs, an opportunity to present evidence to the Awarding Authority that the Contractor is in compliance with the requirements of this Article, or that there is some justifiable reason for waiving the requirements of this Article in whole or in part. The Awarding Authority may invite SOMWBA to participate in any proceedings undertaken pursuant to this paragraph.
- C. Upon a showing that the Contractor is in full compliance with the requirements of this Article, or that the Contractor has met or will meet the MBE/WBE participation goals for this Contract, the Awarding Authority shall release any funds withheld pursuant to clause A (1) above, and lift any suspension of the Contractor's performance under clause A (2) above.

9. Liquidated Damages; Termination

- A. If payment by the Awarding Authority or performance by the Contractor is suspended by the Awarding Authority as provided in paragraph 8 above, the Awarding Authority shall have the following rights and remedies if the Contractor thereafter fails to take all action necessary to bring the Contractor into full compliance with the requirements of this Article, or if full compliance is no longer possible because the default of the Contractor is no longer susceptible to cure, if the Contractor fails to take such other action as may be required by the Awarding Authority to meet the MBE/WBE participation goals set forth in this Contract:
- (1) The Awarding Authority may terminate this Contract, and/or
 - (2) The Awarding Authority may retain from final payment to the Contractor, as liquidated damages, an amount equal to the difference between:
 - (a) The total of the MBE/WBE participation goals set forth in this Contract, and;
 - (b) The amount of MBE/WBE participation credit earned by the Contractor for MBE/WBE Work performed under this Contract as determined by the Awarding Authority, the parties agreeing that the damages for failure to meet the MBE/WBE participation goals are difficult to determine and that the foregoing amount to be retained by the Awarding Authority represents the parties' best estimate of such damages. Any liquidated damages will be assessed separately for MBE and WBE participation.

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

10. Reporting Requirements

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

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

The Awarding Authority reserves the right to waive any provision or requirement of this Article if the Awarding Authority determines that such waiver is justified and in the public interest. No such waiver shall be effective unless in writing and signed by a representative of the Awarding Authority's Affirmative Marketing Construction Officer (AMCO) or the office of its General Counsel. No other action or inaction by the Awarding Authority shall be construed as a waiver of any provision of this Article.

EXHIBIT A

**SCHEDULE FOR PARTICIPATION
BY MINORITY/WOMEN BUSINESS ENTERPRISES**

Project Number _____
Project Location _____
Project Name _____

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

BIDDER CERTIFICATION:

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

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

MBE Goal: \$ _____
\$ _____

Total Dollar Value of MBE Commitment:

WBE Goal: \$ _____
\$ _____

Total Dollar Value of WBE Commitment:

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

Name of Firm _____

Business Address _____

January 10, 2007

Print Name _____

-

Authorized Signature _____

Title _____

Telephone No. _____
No. _____

Fax

Date _____

EXHIBIT B

**LETTER OF INTENT
MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION**

(To be completed by MBE/WBE, and submitted by the General Bidder to the Municipal Affirmative Marketing Construction Officer (AMCO) within five (5) working days of the opening of General Bids or by Filed Sub-bidder with its bid.)

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

Indicate SOMWBA Certification:

_____ **MBE**
 _____ **WBE**
 _____ **M/WBE**

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

MBE/WBE PARTICIPATION

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

Total Dollar Value: \$ _____

Name of MBE/WBE Firm _____

Business Address _____

January 10, 2007

Print Name _____

Authorized Signature _____

Title _____

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

Date _____

EXHIBIT C

**CONTRACTOR PROGRESS PAYMENT REPORT
MINORITY/WOMEN BUSINESS ENTERPRISES PARTICIPATION**

Project Number: _____

Project Name: _____

Project Location: _____

Date: _____

Periodical Payment No.: _____

General Contractor: _____

MBE and/or WBE: _____

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

1. The total price to be paid to the above-named Minority Business Enterprise _____ and/or Women Business Enterprise _____: \$ _____
2. The amount remitted to the Minority Business Enterprise and/or Women Business Enterprise as of the above date for work performed under this project: \$ _____
3. Balance due the Minority Business Enterprise and/or Women Business Enterprise as of the above date for work performed under the above-named project: \$ _____
4. Comments or explanation of amounts indicated under items 1 and 2 above:

January 10, 2007

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

General Contractor:

Minority and/or Women Business Enterprise

(Signed)

(Signed)

(Title)

(Title)

(Date)

(Date)

SECTION 01 11 00: SUMMARY OF WORK

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. This Section includes the following:
1. Work covered by the Contract Documents
 2. Contract Method
 3. Contract Conditions
 4. Work under other contracts
 5. Work Sequence
 6. Owner-furnished products
 7. Permits, inspection and testing required by Governing Authorities
 8. Specification formats and conventions.
 9. Reference standards.
 10. Miscellaneous Provisions
 11. Miscellaneous
 12. Project Time
- B. Related Sections include the following:
1. Section 013100 - PROJECT MANAGEMENT AND COORDINATION, for field engineering and coordination requirements.
 2. Section 013119 - PROJECT MEETINGS, for pre-construction conference and regular site meetings.
 3. Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION, for requirements for preparing and submitting progress schedule, including preliminary submittal of sequencing plan.
 4. Section 011400 - WORK RESTRICTIONS, for contractor's use of premises and other contract requirements during construction.
 5. Section 015000 - TEMPORARY FACILITIES AND CONTROLS, for additional information on temporary measures required during construction.

1.3 WORK UNDER THIS CONTRACT

- A. Project Identification:
6th Floor Office Renovation
Arlington High School
- B. Project Location:
869 Massachusetts Avenue
Arlington, MA
- C. Owner/Awarding Authority:
Town of Arlington, MA
Contact Person: Adam W. Chapdelaine

- D. Architect:
Turowski2 Architecture, Inc.
P.O. Box 1290
313 Wareham Road
Marion, MA 02738
Contact Person: Peter J. Turowski
- E. Description of the Work
1. **General:** This is a limited scope renovation project. Work will occur in areas of the space that are occupied. Coordination with the Owner and the Owner's forces will be required. The Contractor will need to coordinate with the administrative and custodial staff to maintain safe egress and access during the renovation project.
 2. **Interior Renovation Work:** Office re-organization and finish upgrading in select areas of the 6th Floor of Arlington High School, the School District Administration Offices. Renovation work includes demolition, wall construction, new ceilings, doors, finish work, and HVAC, fire protection, and electrical upgrades.
 3. **HVAC Upgrades:** Partial heating system upgrade, including new roof-top unit, duct reconfiguration, new condensing unit, and split ductless air conditioning.
 4. **Electrical Upgrades:** Work associated with heating system upgrades, as well as lighting, fire alarm, and conduit for Owner's technology/wiring.
 5. **Hazardous Materials Removal:** All interior demolition will occur under containment. Asbestos-containing flooring will be removed only to the extent required by demolition of existing walls and construction of new walls.

1.4 CONTRACT METHOD

- A. Project will be constructed under a single prime contract. This Contract shall be a General Contract for Construction, bid as required by Massachusetts General Law Ch. 149A – J.

1.5 CONTRACT CONDITIONS

- A. This Contract is subject to applicable State and local laws and all amendments thereto. Where any requirements contained herein do not conform to statutes governing the Work of this Contract, the statutes shall govern.
- B. This Project will be constructed for a political subdivision of the Commonwealth of Massachusetts, and is therefore exempt from State Sales and Use Tax. All bids shall be prepared and purchase of materials for the Project made on the basis of such exemption. After execution of the Contract, the Owner will furnish the Contractor with the exemption number to be used.
- C. The provisions of the Federal Occupational Safety and Health Act (OSHA) apply to the execution of the Work of this Contract, in addition to all other laws, ordinances, rules, regulations, and orders of any Federal, State, or local public authority bearing on the performance of the Work.
- D. Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if, through mistake or otherwise, any such provision is not inserted, or is not correctly inserted, then upon application of either part the Contract shall forthwith be physically amended to make such insertion or correction.

1.6 WORK SEQUENCE

- A. General: The Contractor's attention is directed toward the critical activities and limitations in the contract documents to highlight unusual conditions present in this Project.
 - 1. The Contractor shall be responsible for scheduling the Work accordingly, and in conformance with requirements of all other specifications for the Project.
 - 2. Sequencing requirements shall be clearly identified on all construction schedules required under Section 013200 – CONSTRUCTION PROGRESS DOCUMENTATION.
- B. Owner Responsibility: Prior to commencement of construction at the site, the Owner will remove all school belongings from the work areas in Rooms 605, 606, 607, 608, 609, 610. See Phasing Plan.
- C. Weather Protection: For requirements, refer to Section 015000 – TEMPORARY FACILITIES AND CONTROLS.
- A. Note that items labeled "N.I.C." on the Drawings will be furnished and installed by the Owner under a separate contract after the completion of the Work.

1.7 PERMITS, INSPECTION AND TESTING REQUIRED BY GOVERNING AUTHORITIES

- A. If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested, or approved, the General Contractor shall give the Designer and such Authority timely notice of its readiness so the Designer may observe such inspection and testing.
- B. Prior to the start of construction, the General Contractor shall complete application for a Building Permit to the local building department. Such Permit shall be displayed in a conspicuous location at the project site.
- C. Building permits and other permits required by local authorities are being waived for this project.

1.8 REFERENCE STANDARDS

- A. For products specified by association or trade standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the bid date, except when a specific date is specified.
- C. Obtain copies of standards when required by Contract Documents. Maintain copy at job sit during progress of the specific work.

1.9 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "Master Format 2004 Edition" numbering system.
 - 1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. All instructions in the Specifications are addressed to the Contractor unless the responsibility of the Designer or Owner is clearly indicated.
 - a. Where products are listed or described in outline form, the phrase "The Contractor shall furnish these products" is implied.
 - b. Where installation instructions or performance criteria are listed or described in outline form, the phrase "The Contractor shall perform the Work in accordance with these requirements" is implied.
 - c. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- C. Definitions:
1. Indicated: The word "indicated" refers to graphic representations, notes or schedules on Drawings, Paragraphs or schedules in Specifications, and similar requirements in Contract Documents. Terms such as "shown", "noted", "scheduled", and "specified" are used to help locate a reference. No limitation on location is intended except as specifically noted.
 2. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted", are hereby defined as "directed by Designer", "requested by Designer", "authorized by Designer", etc. No implied meaning shall be interpreted to extend the Designer's responsibility into the Contractor's area of construction supervision.
 3. Approve: The term "approved" when used in conjunction with the Designer's action on the Contractor's submittals, applications, and similar requests, is limited to the duties and responsibilities of the Designer as stated in GENERAL CONDITIONS. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
 4. Furnish: Supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.
 5. Install: Operations at Project Site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
 6. Provide: To furnish and install, complete and ready for intended use.
 7. Installer: The Contractor or entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 8. Owner: The Awarding Authority.
 9. Authority having Jurisdiction: Any State, Local, or legal authority, as defined by statute.

1.10 MISCELLANEOUS PROVISIONS

- A. Discovery: If during the course of work, articles of unusual value, or of historical or archaeological significance are encountered the ownership of such articles is retained by the Owner, and information regarding their discovery shall be immediately furnished to the Designer.
 - 1. If the nature of the article is such that the work cannot proceed without danger of damaging same, work in that area shall be immediately discontinued until the Designer has decided the proper procedure to be followed.
 - 2. Any time lost thereby shall be a condition for which the time of the Contract may be extended.
 - 3. All costs incurred after discovery in the salvaging of such articles shall be borne by the Owner.

- B. Coordination with School Staff:
 - 1. The School staff shall perform an initial clearing of the work areas. In June 2013, prior to commencement of any demolition, the Contractor, Owner, and Architect shall review together the extent of clearing required to perform the work.
 - 2. The School custodial staff will perform routine maintenance during the Summer months, including refinishing of floors. The Contractor's schedule shall accommodate refinishing of floors. Coordinate access to corridor and other spaces with School custodial staff.

1.11 PROJECT TIME

- A. Phasing
 - 1. See drawings for phasing limits and sequence.

- B. Timeframe.
 - 1. Substantial completion of all work shall be achieved no later than August 15, 2013.
 - 2. Schedule milestones.
 - a. April 29, 2013 – estimated contract signing.
Begin 61 calendar days mobilization, existing conditions review, submittal processing (refer to 1.11.5 Schedule of Long Lead Items).
 - b. July 1, 2013 – Contractor access to site.
Begin 46 calendar days work period.
 - c. August 14, 2013 – Contractor's punch list.
 - d. August 15, 2013 – Substantial completion.
 - e. September 3, 2013 – Final completion
 - 3. Prior to July 1, 2013, the Contractor may access the site ONLY to verify field conditions and perform work previously approved by the Architect and School Principal. Such work shall be limited to afterschool hours. Workers performing work shall be subject to CORI checks.
 - 4. The Contractor's coordination of field verification, submittal preparation, and review of long lead items is a critical element in meeting the project schedule. The Architect will expedite review of submittals for long lead items. Failure to submit complete packages of shop drawings and product data so that timely expedited processing and review of submittals can occur shall not affect the date of substantial completion and may incur liquidated damages.
 - 5. Schedule of long lead items.
 - a. Within 3 days of signing the contract, the Contractor shall provide a list of all materials and equipment having a lead time of six (6) weeks or longer for delivery to the site. The list

- shall include the anticipated lead time for each item.
- b. Within five (5) days of signing the contract, the Contractor shall provide a schedule for all such materials and equipment in "a." above. The schedule shall show at a minimum:
 - i. Installation durations, in days or manhours.
 - ii. Delivery durations.
 - iii. Manufacturing durations.
 - iv. Submittal preparation and review duration.
 - c. The schedule shall be reviewed by the Owner and Architect; adjustments shall be negotiated as necessary.
 - d. At the preconstruction meeting, the times of work at the site by the Contractor and Owner's staff shall be established.
 - e. The approved schedule of long lead items shall be the basis for the Construction Progress Schedule.
6. Final completion, inclusive of all punch list and closeout items, shall be achieved no later than 21 calendar days after substantial completion.
 7. If work is not proceeding according to the approved schedule, the Owner reserves the right to instruct the Contractor to increase manpower so that the work may be completed by the date of substantial completion.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 14 00: WORK RESTRICTIONS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

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

1.2 DESCRIPTION OF WORK

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
1. Contractor responsibility for Architect's additional services.
 2. Construction Documents, Project Electronic Files and graphic reproduction of Contract Documents.
 3. Interpretation and modification of Contract Documents.
 4. Contractor's reports.
 5. Cleaning materials
 6. Safety and disposal requirements.
 7. Conduct of the Work.
 8. Hours of work.
 9. Contractor use of premises.
 10. Existing Utilities.
 11. Noise control.
 12. Safety and disposal requirements and accident prevention.
 13. Welding and cutting.
 14. Municipal police services
 15. Storage of materials off-site
 16. Dust control.
 17. Cleaning during construction.
 18. Debris control and removal of rubbish.
 19. Pollution control.
 20. Owner's occupancy requirements.
 21. Project documentation.
- B. Related work includes, but is not limited to, the following work under other Sections:
1. Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION: Preparation and execution of construction schedule.
 2. Section 013100 - PROJECT MANAGEMENT COORDINATION: Procedures and responsibilities for coordinating the Work.
 3. Section 013300 - SUBMITTAL PROCEDURES. Submittal procedures.
 4. Section 015000 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS, for additional information on temporary measures required during construction.
 5. Section 017700 - CLOSEOUT PROCEDURES: Procedures for completing the Work.
 6. Section 017839 - PROJECT RECORD DOCUMENTS: Preparation of record drawings and other documents.

1.3 SUBMITTALS

- A. General: Refer to Section 013300 - SUBMITTAL PROCEDURES, for submittal provisions and procedures.

- B. Logistics Plan:
1. Contractor shall submit to the Owner, at the Pre-construction Meeting, a detailed Logistics Plan, which shall include:
 - a. Delivery hours and delivery routes.
 - b. Gate location and wheel washing location.
 - c. Hours of work.
 - d. Trailer area and layout of trailers.
 - e. Parking locations for use of Owner and Contractor within the area of work.
 - f. Temp fencing.
 - g. Locations for waste management containers.
 - h. Protection of existing curbs and walkways.
 - i. Lighting Plan.
 - j. Rigging Plan.
 - k. Temporary roof loading and protection.
 - l. Any other information requested by the Owner/Designer.
 2. Refer to Section 015000 - TEMPORARY FACILITIES AND CONTROLS, for specifications for temporary construction and other items to be shown on Logistics Plan.
 3. No work shall commence until the Logistics Plan has been approved.

- C. Reports:
1. Documentation of off-site storage facilities.
 2. With each Application for Payment, submit the following reports, compiled on a monthly basis:
 - a. Contractor's Reports
 - b. Proof of submission of Certified weekly payrolls to Owner.

1.4 CONTRACTOR RESPONSIBILITY TO THE OWNER FOR ARCHITECT'S ADDITIONAL SERVICES

- A. The Contract between the Owner and the Architect contains provisions for additional services that may be required of the Architect during construction due to unforeseen conditions.
1. Where such additional services become necessary due to the activities of the Contractor, as determined by the Owner, costs for such services will be the responsibility of the Contractor, and will be deducted from the Contract Amount.
- B. Additional services for which the Contractor is responsible for cost to the Owner may include the following activities of the Architect:
1. Review of Requests for Information and Change Order Requests for work determined to be covered in the Contract Documents. Refer to related Articles in this Section.
 2. Continuation of construction administration beyond the dates specified for Final Completion of the Work: Refer to Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION.
 3. Review of re-submitted submittals and Substitution Requests that have been rejected: Refer to Section 013300 - SUBMITTAL PROCEDURES.
 4. Re-inspection of incomplete work: Refer to Section 017700 - CLOSEOUT PROCEDURES.
 5. Design services for the resolution of non-conforming work, including retesting of nonconforming work by Owner's testing agency.

1.5 CONSTRUCTION DOCUMENTS

- A. The General Contractor and each Subcontractor shall retain copies of the Contract Documents issued to them for bidding purposes.
 - 1. The Owner will furnish to the General Contractor, without charge, three (3) complete sets of the Contract Documents, including Drawings and Specifications, for use during the construction period.
 - 2. The Owner will furnish to each Filed Sub-Contractor, without charge, one (1) copy of those Drawings and Specifications directly related to the work of their respective trades for use during the construction period.
 - 3. Extra sets returned by bidders are the property of the Owner.

- B. All other hard copies of the Contract Documents required by the Contractor or Subcontractors for use during the construction period shall be purchased by the party requiring same. Owner will furnish approximate costs of such additional copies and will transmit originals to local printing companies with whom he regularly does business, but will not receive bills for such printing through his account. All negotiations for such printing shall be between Contractor and Printer.
 - 1. Refer to provisions in this Section, for electronic copies of documents to be made available for the Contractor's use during construction.
 - 2. Refer to Section 017839 - PROJECT RECORD DOCUMENTS, for additional sets to be provided by the Owner to the Contractor for the purpose of maintaining record prints of the Work as construction proceeds.

1.6 PROJECT ELECTRONIC FILES

- A. Definitions:
 - 1. Contract Documents: Printed hard copies of drawings and other documents, as defined in the General Conditions and listed in the signed copy of the Form of Agreement between Owner and Contractor.
 - a. In case of conflict between the Contract Documents and documents obtained through electronic means, the Contract Documents shall govern.
 - 2. Project Electronic Files: Electronic copies of electronic documents for the Project.

- B. The Architect will make electronic documents available in PDF format. Editable files may be made available at the discretion of the Architect.

- C. Permitted Use of Project Electronic Files: Use of electronic files by the Contractor and Sub-Contractors is limited to the following activities:
 - 1. Project Electronic Files may be used as a guide only for the preparation of Coordination Drawings and Record Drawings to be submitted as a requirement for the Project.
 - 2. Project Electronic Files may be used as a guide only for preparation of shop drawings. Exact copies of Contract Documents will not be accepted if submitted for these purposes, unless specifically permitted by an individual specification Section.

- D. Responsibilities of Contractor: Use and reproduction of Project Electronic Documents are subject to the following conditions:
 - 1. The use of Project Electronic Files, reproduced either electronically or by other graphic reproduction methods, does not in any way alter the responsibilities of the Contractor for final system coordination. The Contractor shall incur all liability in this respect.

2. The Contractor and all Subcontractors are responsible for checking the dimensions and completeness of the Project Electronic Files, and for determining any possible errors and omissions, as required by the General Conditions.
 3. The Contractor is responsible for updating Project Electronic Files as necessary to incorporate changes to the Work shown in Addenda and documents issued during construction.
 4. In no event shall the Architect or any other Person or Firm involved in the creation, production or distribution of the reproducible or electronic documents, be liable to the persons utilizing the documents, on account of any claim for damages. Each Person or Firm utilizing these documents agrees to release, indemnify, hold harmless and defend the Architect, its officers, employees and consultants from an against all liability arising out of such firm's use of the electronic or reproduced documents or information referred to here- in.
- E. Ownership of Documents: By transferring copies of Project Electronic Files, the Architect does not in any way convey the copyright in the designs contained therein, nor do they convey a license to copy or use them for any purpose except as required for the construction of the Project.
- F. License for Software: By transferring copies of Project Electronic Files, the Architect does not in any way convey transfer license to use the software on which the documents were prepared. Each entity using Project Electronic Files is responsible for obtaining licenses as needed for its use of those files.

1.7 GRAPHIC REPRODUCTION OF CONTRACT DOCUMENTS

- A. Reproduction of Contract Documents issued for the Project, by graphic reproduction methods, shall be subject to the conditions outlined for reproduction of Project Electronic Files.

1.8 INTERPRETATION AND MODIFICATION OF CONSTRUCTION DOCUMENTS

- A. Refer to General and Supplementary Conditions for general information on Change Orders, Work Change Directives, Field Orders and Architect's written amendments and clarifications. The intent of this Article is to provide for additional procedures to be followed during construction.
- B. Requests for Information: Each time the Contractor or Subcontractor has a reasonable question on the interpretation of the Contract Documents, they shall submit in writing a Request for Information (RFI) to the Architect for response.
1. The Contractor shall examine field conditions carefully and review the Drawings and Specifications thoroughly prior to issuing an RFI.
 2. The Contractor shall keep a log of RFI's, numbering them in the order in which they are issued.
 3. Each RFI shall contain a clear statement of the question, references to relevant Contract Documents and additional background information as needed to facilitate the Architect's review.
 4. All requests for information from Subcontractors shall be made through the Contractor and addressed to the Architect, and the Architect will distribute them as needed to the appropriate Consultants. A copy of each RFI shall be given to the Owner' or On-site Clerk.
 5. RFI's shall be issued in a timely manner to permit a thorough review and preparation of a response by the Architect and their Consultants.
 6. The Architect will prepare a written response to each RFI within 10 workdays, or sooner if the Contractor provides a realistic date when the response will be needed.

- C. Proposal Requests: During construction, it may become necessary or desirable to modify the Contract Drawings or Specifications in response to concealed existing conditions, changes in the Owner's program or other unforeseen circumstances.
1. Where such a modification may involve a change in the Contract price or time, the Architect will prepare a Proposal Request describing the modification under consideration, including sketches or drawings, specifications and other information to permit pricing by the Contractor.
 2. Copies of each Proposal Request and its attachments will be distributed to the Owner, Clerk of the Works and Contractor.
 3. The Contractor shall respond in a timely manner with a Proposed Change Order detailing the estimated costs and change in Contract duration, for review by the Architect and approval by the Owner.
 4. A Proposal Request will not constitute direction to proceed with the modification unless accompanied by a Work Change Directive and an estimated price.
- D. Change Order Requests: If the Contractor is required to perform Work that they consider to represent a change in the cost of the Project, they may submit Change Order Requests for such work.
1. Each Change Order Request shall be accompanied by a document describing the modification under consideration, including sketches or drawings, specifications and other information to permit review of pricing by the Architect and Owner.
 2. Distribute copies of each Change Order Request and its attachments to the Owner, Clerk of the Works and Architect.
 3. The Architect and Owner will respond in a timely manner with a Proposed Change Order incorporating the Change Order Request if it is approved.
 4. Verbal approval of a Change Order Request will not constitute direction to proceed with the modification unless accompanied by a Change Order, or a Construction Change Directive with an estimated price.
- E. Architect Review of Contractor-Generated Requests for Information and Change Order Requests: The Architect will review and prepare written responses to the Contractor's Requests for Information and Change Order Requests that are submitted in accordance with the requirements of this section.
1. If the Contractor submits an excessive number of requests for information that are incomplete, or for which the information requested is available from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared or other prior Project correspondence or documentation, then the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to review those requests for information.
 2. If the Architect determines that the Work covered by a Change Order Request is covered by the scope of the Contract Documents, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to evaluate proposals and prepare Instruments of Service associated with such Change Order Request.
 3. Refer to other paragraphs in this Section for procedures required in cases where Contractor is responsible to the Owner for costs for Additional Services of the Architect.

1.9 CONTRACTOR'S REPORTS

- A. A daily report summarizing the work performed, weather conditions, number of workers, amount and kinds of equipment, unusual occurrences, and the like shall be submitted by the Contractor's Field Superintendent to the Architect, the Owner, the Clerk of the Works, each working day covering the work performed on the previous working day.

- B. Form of the daily report shall be as approved by the Architect.
- C. Attention is directed to recent amendments to MGL Chapter 149, Section 27B requiring submission of certified weekly payrolls directly to the Awarding Authority by every contractor and sub-contractor doing public work.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by manufacturer or surface material to be cleaned.
- C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.1 CONDUCT OF WORK

- A. The Contract Site shall be as shown on the Drawings, and shall include the entire area bound by the "Contract Limit" or "Limit of Work" lines for each phase, as well as all areas outside of the Limit of Work Lines when required for performance of work under this Contract.
- B. Contractor shall take all steps necessary to protect existing conditions to remain. Damage to existing work caused by Contractor's operations under this Contract shall be repaired at Contractor's expense. Provide photographic survey ahead of construction activities to document existing conditions
- C. Any street, paving, curb and/or sidewalk damaged as the result of work under this Contract, whether within or outside the limits of the Work, shall be repaired and/or replaced with new matching construction by the Contractor at his expense and in a manner satisfactory to the Architect and authorities having jurisdiction.
- D. Protection of Curbs and Walkways: Where existing curbs or walks are to remain, and trucking is required over them, they shall be suitably protected as shown on approved Logistics Plan.
- E. Provide continuous, lawful, safe, adequate and convenient access to the site
- F. Conduct of Construction Personnel: Smoking, foul language, and fraternization with students, staff and faculty is not permitted.
- G. All workers will be required to pass a CORI check, prior to being allowed onto the site. See CORI Form at the end of this section.
 - 1. Arlington Public Schools requires background checks according to Chapter 71 Section R38 of the Massachusetts General Laws for all contractors and subcontractors working in the schools while school is in session.

2. The Contractor shall provide information needed to perform checks of criminal records of all personnel who will be working at the site and have unmonitored access to children during school operation hours and during hours of afterschool program activities. The Appropriate Form is contained at the end of this section, and when required, the completed forms shall be sent to the School a minimum of two (2) weeks before Contractor's personnel will be on site. Forms shall be sent to the attention of:

Karen Tassone, Benefits Administrator
Superintendent's Office
Arlington Public Schools
869 Massachusetts Avenue
Arlington, MA 02476-4799
Fax: (781) 316-3505

3. No Contractor will be allowed on site without being approved through the CORI review process.

3.2 HOURS OF WORK

- A. Hours of work shall be from 7:00 AM until 4:00 PM, excluding Saturdays, Sundays, and holidays, unless otherwise approved by the Owner. Deliveries shall occur within these hours. Trucks shall not arrive at the site outside of the work hours.
- B. The Owner will unlock the building at 7:00 AM on regular work days and lock the building at 4:00 PM on regular work days. Special arrangements will need to be made for locking and unlocking the building on weekends, holidays, and school vacation days or for evening work.
- C. The Contractor shall comply with applicable local ordinances.

3.3 CONTRACTOR USE OF PREMISES

- A. General: Contractor shall have full use of premises within established L.O.W. areas for construction operations, including use of Project site, during construction period.
 1. Confine operations at the site to areas permitted by laws, by-laws, permits and contract limit lines.
 2. Do not unreasonably encumber the site with materials or equipment.
 3. Coordinate with Owner and Architect work in connection with adjacent occupied buildings or areas, driveways, walks, and other facilities which would prevent access thereto or interrupt, restrict, or otherwise infringe upon use thereof.
- B. General: Contractor will have full use of premises for construction operations as indicated on Drawings by the limit of work areas.
 1. Schedule any work that will obstruct adjacent streets in accordance with the requirements of the Owner.
 2. Maintain access to existing walkways, streets and other adjacent occupied or used facilities. Do not close or obstruct walkways, streets or other occupied or used facilities without written permission from Owner and other authorities having jurisdiction.
 3. Owner Occupancy: Allow for Owner occupancy of portions of Project site.
- C. Contractor Parking: The Owner will designate an area or areas for contractor parking. Each Subcontractor shall make arrangements with Contractor for required parking of his vehicles. The Owner reserves the right to change contractor parking areas.

- D. On-Site Delivery and Storage of Construction Materials: Do not permit materials and fabricated work to be stacked on, or be transported over, floor and roof construction in such a manner as to stress any construction beyond the designed live loads. Assume full responsibility for protection and safekeeping of products stored on premises. Obtain and pay for use of additional storage or work areas needed for operations. Limit use of site to work and storage of materials for this project.
 - 1. Maintain clean, dry storage areas for construction materials and minimize their exposure to dust. Refer to individual Division 3 through 50 Sections for additional requirements.
 - 2. Do not store foamed polystyrene, polyurethane or like materials within the building. Take proper precautionary measures regarding the Storage of such materials outside the building.
- E. Contractor shall take all necessary safety precautions and maintain an adequate level of fire protection at all times.
- F. Do not use areas outside the Limit of Work area for temporary storage or structures without specific written permission from the Architect and Owner.
- G. Access to the Site: The Owner will designate an entry point and stair for the Contractor's use.

3.4 EXISTING UTILITIES

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- B. Immediately repair any active existing utility lines (cables, conduit, ducts, and piping), damaged during the course of construction. Protect and maintain such active existing utilities in use, until relocation of same has been completed or utilities have been cut, capped, or prepared for new service connections, as applicable. Perform such repair and protection work at no additional cost to the Owner.
- C. If any existing active utility not indicated on the Drawings is unintentionally damaged, and such utility is to remain, immediately repair the damage and restore the utility to its original integrity. Reimbursement of cost for performing such repair will be made by an adjustment in the Contract Price in accordance with the General Conditions of the Contract.
- D. Any adjustment as outlined above shall be based on the assumption that the Contractor has performed in a prudent manner at the time such damage occurred. If extra expense is incurred in protecting and maintaining any utility line not shown on the Drawings, and not reasonably inferred to exist, an adjustment in the Contract Price shall be made.
- E. The Owner will cooperate and assist the Contractor in locating and identifying utilities.
- F. If it becomes necessary to interrupt power, water line, sewer, gas or other utilities to adjacent buildings, notify the Architect and Owner at least two (2) days in advance. Schedule such interruptions at such times as will minimize disruption and inconvenience to users.

3.5 NOISE CONTROL

- A. Execute construction work by methods and by use of equipment that will reduce noise and

which will provide minimum interference with adjacent owner occupancy.

1. Employ construction methods and equipment that will produce the minimum amount of noise.
 2. Equip air compressors with silencers, and power equipment with mufflers.
 3. Handle vehicular traffic and scheduling to reduce noise.
- B. Do not allow radio and electronic entertainment equipment to be operated at volume that makes ordinary conversation difficult at ten (10) feet from such equipment. Do not operate such equipment in work areas occupied by the Owner.

3.6 SAFETY AND DISPOSAL REQUIREMENTS

- A. Standards: Maintain project in accordance with State Building Code and local ordinances.
- B. Hazards Control: Store volatile wastes in covered metal containers and remove from premises. Prevent accumulation of wastes which create hazardous conditions. Provide adequate ventilation during use of volatile and noxious substances.
- C. Disposal: Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws. Do not burn or bury rubbish and waste materials on project site. Do not dispose of hazardous wastes such as solvents, mineral spirits, oil, paint, paint thinner in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

3.7 ACCIDENT PREVENTION

- A. Comply with all Federal, State and municipal recommendations and requirements for safety and accident prevention, those of the Associated General Contractors of America and the American National Standards Institute (ANSI Standard A10.2). Conduct regular, frequent inspections of the site for compliance with safety regulations.
- B. Neither the Owner nor the Architect will be responsible for providing a safe working place for the Contractor, Subcontractors, or their employees, or any individual responsible to them for the Work.

3.8 WELDING AND CUTTING

- A. Where electric or gas welding or cutting work is done above or within ten (10) feet of combustible material or above space that may be occupied by persons, use interposed shields of incombustible material to protect against fire damage or injury due to sparks and/or hot metal.
- B. Place tanks supplying gases for gas welding or cutting at no greater distance from the work than is necessary for safety, securely fastened and maintained in an upright position where practicable. Such tanks, when stored for use, shall be remote from any combustible material and free from exposure to the direct rays of the sun or high temperatures. Storage shall be secured under lock and key, to prevent unauthorized use of gas and equipment.
- C. Maintain suitable fire extinguishing equipment near all welding and cutting operations. When operations cease for the noon hour or at the end of the day, thoroughly wet down the surroundings adjacent to welding and cutting operations. Properly protect any new materials, stored or installed, that are subject to water damage.

- D. Station a worker equipped with suitable fire extinguishing equipment near welding and cutting operations to see that sparks do not lodge in floor cracks or pass through floor to wall openings or lodge in any combustible material. Keep the worker at the source of work which offers special hazards for a minimum of thirty (30) minutes after the job is completed to make sure that smoldering fires have not been started.
- E. Place a qualified electrician in charge of installing and repairing electric and arc welding equipment.
- F. Notify Arlington Fire Department 24 hours ahead of any steel cutting, open flame work or welding activities in occupied buildings.

3.9 MUNICIPAL POLICE/FIRE SERVICES

- A. Make all necessary arrangements with the municipal police and fire department in advance of times when regular, off-duty, or reserve police officers will be needed for traffic control or protection due to operations performed under this Contract.
- B. Pay police/fire officers and firemen in accordance with rates established by the municipality for such services:
- C. Extend the Worker's Compensation Insurance and Employer's Liability Insurance required under the General Contract to cover police used on the Project.

3.10 STORAGE OF MATERIALS OFF SITE

- A. The Contractor, Subcontractors and Sub-subcontractors shall obtain prior written approval from the Owner through the Architect for permission to store materials to be incorporated in the Work, for which Progress Payments will be requested, at off-site locations. Any and all charges for storage, including insurance, shall be borne solely by the Contractor. Before approval, Owner will require proper proof of insurance and a letter in which is furnished:
 - 1. The names of the Contractor and/or Subcontractor or subordinate Subcontractor leasing the storage area.
 - 2. The location of such leased space.
 - 3. Description of the leased area: The entire premises or certain areas of a warehouse giving the number of floors or portions thereof.
 - 4. The date on which the material is first stored.
 - 5. The value of the material stored.
 - 6. Transfer of title for such materials in a form acceptable to the Owner.
 - 7. Insurance Certificated naming location of storage and Owner as additional insured.
- B. Requirements for storage facility at which materials will be stored off-site:
 - 1. The storage facility shall be a bonded warehouse.
 - 2. The Contractor shall permit access to the storage facility to the Owner and Architect upon request.
- C. Contractor, Subcontractors and subordinate Subcontractors shall provide prior to the request for payment for such stored materials, adequate advanced notice, to the Architect so that the Owner or Architect can inspect, at their convenience, the materials being stored at any location.
- D. Each sealed carton shall be marked with the Project name, the Owner's name and the Architect's name as they appear in the Agreement.

- E. A perpetual inventory shall be maintained for all materials held in storage for which payment has been requested.
- F. Payment for materials stored off site shall be at the sole discretion of the Owner. Any additional costs to the Owner resulting from storage of material off site for which payment is requested, such as, but not limited to, travel expenses and time for inspectors shall be back charged to, and paid by, the Contractor.

3.11 DUST CONTROL

- A. Maintain the construction site, stockpiles, access, staging and parking areas used for the Work, free of dust which would cause a hazard or a nuisance to those at the site or adjacent sites.
- B. Provide environmentally safe and positive methods and dust control materials to minimize raising dust from construction operations, and provide positive means to prevent air-borne dust from dispersing into the atmosphere.
- C. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
- D. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.
- E. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces, including paint, coatings, sealants, caulking, adhesives.
- F. Furnish, erect, and maintain for the duration of the work period, temporary fire-retardant dust proof coverings and partitions as required to prevent the spread of dust beyond the immediate area where work is being performed.
- G. These provisions do not supersede any specific requirements for methods of construction or applicable regulations or general conditions set forth elsewhere in the Contract with regard to performance obligations of the Contractor.

3.12 CLEANING DURING CONSTRUCTION

- A. Execute cleaning during progress of work and at Substantial Completion, as required by General Conditions and as herein specified.
- B. Maintain premises and public properties free from accumulations of waste, debris and rubbish caused by operations. At completion of work, remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all exposed surfaces; leave project clean and ready for occupancy.
- C. Cleaning shall be in addition to cleaning specified under other sections and shall include all surfaces, interior and exterior in which or to which the Contractor has had access.
- D. Refer to Sections of the Specifications for cleaning of specific products.

- E. Execute cleaning to ensure that the building, the site, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.
- F. Provide on-site containers for collection of waste materials, debris and rubbish.
- G. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal areas off site.
- H. Handle materials in a controlled manner with as few handling as possible. Do not drop or throw materials from heights.
- I. Schedule cleaning operations so that dust and other contaminants resulting from cleaning processes will not fall on wet newly painted surfaces, uncured caulking, sealants, adhesives, etc.

3.13 DEBRIS CONTROL AND REMOVAL OF RUBBISH

- A. Ensure that each Subcontractor engaged in the Work bears full responsibility for cleaning up during on a daily bases and immediately upon completion of his work, and removes all rubbish, waste, tools, equipment, and appurtenances caused by and used in the execution of his work; but this shall in no way be construed to relieve the General Contractor of primary responsibility for maintaining a clean building and site free of debris, leaving all work broom clean and in a condition satisfactory to the Architect, Project Manager, and Owner.
- B. Provide at least one tightly built chute serving each level which shall lead down to angle offset and sliding panel chute at a convenient loading point for trucks or dumpsters.
- C. Do not permit any material to be thrown from open floors, windows or roof of the building.
- D. Immediately after unpacking, remove all packing materials, case lumber, excelsior, wrapping and other rubbish, flammable and otherwise, from the building and premises.
- E. Initiate and maintain a specific program to prevent the accumulation of debris at the construction site, storage and parking areas, or along access roads and haul routes:
Provide containers for deposit of debris and schedule periodic collection and disposal of debris. Prohibit overloading of trucks to prevent spillage on access and haul routes.
- F. Contractor shall provide snow and ice removal from the contractor access road and the limit of the work area, as required. In addition Contractor shall provide wheel-washing stations at site egress gates, as directed by the Project Manager, to maintain clean neighborhood streets.

3.14 POLLUTION CONTROL, GENERAL

- A. Contractor shall prevent exhaust from contractor's equipment and vehicles for entering occupied buildings or provide a 24 hour advance notice when such cannot be avoided.
- B. Provide methods, means and facilities required to prevent contamination of soil, water and atmosphere by the discharge of noxious substances from construction operations.
- C. Remediation of Spills: Provide equipment and personnel, perform emergency measures required to contain any spillages, and to remove contaminated soils or liquids. Excavate and dispose of

contaminated earth off site and replace with suitable uncontaminated compacted fill and topsoil, in accordance with the requirements of Section 310000 - EARTHWORK.

- D. Take special measures to prevent harmful substances from entering public waters. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams or in sanitary or storm sewers.
- E. Provide systems for control of atmospheric pollutants. Prevent toxic concentrations of chemicals. Prevent harmful dispersal of pollutants into the atmosphere.
- F. Refer to construction phasing plans for information and to the Order of Conditions for sequence of operations for erosion control.

END OF SECTION



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 _____

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

Street Number & Name City/Town State Zip

For Office Use:

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

VERIFIED BY: _____
Name of Verifying Employee (Please Print)

Signature of Verifying Employee

SECTION 01 22 00: UNIT PRICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 SUMMARY

- A. This Section covers those items for which indefinite quantities can be expected and, therefore, pre-agreed prices per unit of work are established as means to determine adjustments to the Contract Price after actual quantities are determined.

1.3 QUANTITIES AND COST ADJUSTMENTS

- A. Refer to individual Specification Sections for methods of measurement and payment for unit prices. As soon as the work involved in each unit cost item has been completed, submit documentation to establish the actual quantities provided. Submit to the Architect for review and issuance of Change Order.
- B. Change Order amount for each unit cost item will be based on actual quantities multiplied by the unit price. This unit price includes all costs as described below.

1.4 UNIT PRICES

- A. Should certain additional work be required, or should the quantities of certain classes of work be increased or decreased from those required by the Contract Documents, by authorization of the Owner, the below unit prices shall, at the option of the Owner, be the basis of payment to the Contractor or credit to the Owner, for such increase or decrease in the work.
- B. The Unit Prices shall represent the exact net amount per unit to be paid the Contractor (in the case of additions or increases) or to be refunded the Owner (in the case of decreases). No additional adjustment will be allowed for labor, materials, installation, substrate preparation, overhead, profit, insurance, general conditions, or other direct or indirect expenses of the Contractor or Subcontractors.

PART 2 - PRODUCTS [Not Used]

PART 3 – EXECUTION

3.1 LIST OF UNIT PRICES

- A. The following unit prices as defined in the Specifications are designated for items of work on the basis of quantities estimated by the Architect. These unit prices will be used to add or deduct from dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount.
- B. Unit Price 1: Removal and Disposal of Vinyl Asbestos Floor Tile, Replacement with New VCT.
 - 1. Description: Section 028213 – ASBESTOS ABATEMENT and Section 096510 – RESILIENT FLOORING AND ACCESSORIES – Removal and disposal of vinyl asbestos floor tile and replace with VCT beyond established base bid quantities if its determined that work must be performed to remove additional material.

2. Unit of Measurement: SF.
- C. Unit Price 2: Construction of Small Mini-containment <10 SF.
 1. Description: Section 028213 – ASBESTOS ABATEMENT – Contractor shall construct a mini-containment consisting of two (2) layers of 6-mil polyethylene sheeting for the removal of up to 5 SF or 5 LF of asbestos-containing materials where locations require additional work.
 2. Unit of Measurement: Per containment.
- D. Unit Price 3: Duplex Electrical Outlets.
 1. Description: Section 260000 – ELECTRICAL – 20A/120 volt duplex receptacle with 25' of wiring.
 3. Unit of Measurement: Per duplex outlet.
- E. Unit Price 4: Duplex Data Outlet Infrastructure.
 2. Description: Section 260000 – ELECTRICAL – Duplex data back box with 12 LF of conduit and pull string.
 4. Unit of Measurement: Per back box.

END OF SECTION

SECTION 01 23 00: ALTERNATES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by Bidders and Filed Sub-Bidders, and stated on the appropriate Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Each General Bidder and each Sub-Bidder shall examine the Alternates generally defined herein and in the Drawings and Specifications and determine any modifications to his work caused by any Alternate whether or not his particular trade Section is mentioned herein.
- B. Listing of Alternates on Bid Forms:
 - 1. Each Filed Sub-Bidder shall enter in the FORM FOR SUB-BID only the amount of the addition or subtraction necessitated by the Alternate that pertains to the work of his trade.
 - 2. General Bidders shall enter a single amount in the appropriate space provided in the FORM FOR GENERAL BID, which total amount shall consist of the Filed Sub-Bidders' amounts and the amount for all work to be performed by the General Contractor.
 - 3. Work of Sections that are affected by Alternates but which are not designated as Filed Sub-Bid Sections shall be included in the work of the General Contractor.
- C. Alternates will be considered in numerical sequence as required by Chapter 149, Section 44G of the Massachusetts General Laws.

1.5 COORDINATION

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
 - 2. The amount listed for each alternate shall include all costs related to coordination, modification and adjustments of the Work associated with that alternate.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 GENERAL

- A. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

3.2 SCHEDULE OF DEDUCT ALTERNATES

- A. Alternate No. 1 (Deduct): Eliminate Rooms 608C, 609C, and All Sprinkler Modifications.
- B. Alternate No. 2 (Deduct): Eliminate Roof Top Unit and Modify Associated Work.

END OF SECTION

SECTION 01 24 00: SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 SUMMARY

- A. The Work of this Section includes requirements for the following procedures:
 - 1. Preparation and submittal of the Preliminary and Final Schedule of Values
- B. Related work includes, but is not limited to, the following work under other Sections:
 - 1. Requirements for construction schedules: Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION.
 - 2. General procedures for submittals: Section 013300 - SUBMITTAL PROCEDURES.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SUBMITTALS

- A. Prepare and submit the following submittals in accordance with the requirements of Section 013300 – Submittal Procedures.
- B. Schedule of Values:
 - 1. Schedule of Values shall be typewritten on 8-1/2 by 11 inch white paper.
 - 2. Submit to the Architect three (3) copies of the Schedule of Values within 7 days of receipt of Notice to Proceed.
- C. List of Subcontractors and Sub-subcontractors: Attached to the Preliminary Schedule of Values shall be a list of the names, addresses (and whether individual, partnership or corporation) of each Subcontractor or Sub-Subcontractor who is to perform all or any part of each subdivision. In the event any Subcontractors, or Sub-subcontractors are not known at the time said schedule is prepared, an amended or supplementary list containing the names of the Subcontractors and Sub-Subcontractors involved and indicating their division of the Work shall be furnished to the Architect as soon as the information is available. A code number for identification on requisitions shall be used to identify the Contractor, each of the Subcontractors and subordinate Sub- contractors, and shall be shown in each requisition where any part of the Work performed by the Contractor, such Subcontractor, Sub-Subcontractors or material supplier is incorporated in the amount of the requisition for which payment is requested.
- D. Monthly Updates: Submit to the Owner with the Schedule of Values on a monthly basis such schedules of quantities and costs, payrolls, reports, estimates, records, and other data as the Owner may request concerning work performed or to be performed under this Contract. The Schedule of Values shall be submitted at the same time as the updated CPM Schedule showing the current status of the work, as required under Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION.

1.5 SCHEDULE REQUIREMENTS

- A. General: Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress re- ports. Coordinate with the Project CPM Schedule. Provide line items for principal subcontract amounts, where appropriate, and for portions of the work designated in this Section.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section. Identify each line item by Specification Number and Title, and by portion of the Work of that Section where the Work of a Section is allocated to more than one line item.
- C. The Schedule of Values shall be arranged in vertical columns identified with titles, including Names of Items; Original Amounts, Percent Completed to Date; Previous Payments; Current Requests; and Balance Not Yet Requested. A summary of the total amount due to date and the amount of the five percent retained shall be included in the statement which shall be signed by the Contractor. A separate sheet shall be included with each requisition showing status of work covered by approved Change Orders. The Schedule of Values shall be revised if later found by the Architect to be inaccurate.
- D. In preparing the Schedule, each sub-division or classification of the Work shall be identified by code number referring to each individual Section (or Sub-Section where applicable) of the Specifications. The Schedule of Values shall be prepared in accordance with AIA Documents G702 and G703.
- E. Initial values will be recognized to be an accurate accounting of the value of the work. Upon request by the Architect, support values given with data that will substantiate their correctness. No value shall exceed \$28,000. Each portion of work shall be broken into materials and labor.
- F. Identify quantities of designated materials or materials stored on which payment is expected to be made.
- G. Use monthly submissions of Schedule of Values only as basis for Contractor's Application for Payment.

1.6 PREPARING SCHEDULE OF VALUES

- A. General Procedures:
 - 1. Prepare Preliminary Schedule of Values for review by Architect and Owner.
 - 2. Incorporate requested modifications to produce a Final Schedule of Values, which will become the basis for documenting the progress of the Work with each Application for Payment.
 - 3. Update Final Schedule of Values as necessary to reflect changes in the Work.
- B. Itemize separate line item cost for each of the general cost items as specified in this Section.
- C. Breakdown installed costs into:
 - 1. Delivered cost of product
 - 2. Total installation cost, with overhead and profit.
 - 3. Construction phase.
 - 4. Note that the Owner is exempt from Sales and Use Tax for all materials incorporated into the Work.
- D. For each line item which has installed value of more than \$20,000.00 breakdown costs to list major products, components, or operations under each line.

- E. Sum of costs of all items listed in schedule shall be equal to total Contract Sum.
- F. Each item shown on an Application for Payment Schedule of Values shall also appear on the CPM Schedule.

1.7 LINE ITEMS FOR SCHEDULE OF VALUES

- A. Work Covered in Division 1: Itemize separate line item cost for each of the following general cost items or as otherwise directed.
 - 1. Builder's Risk Insurance
 - 2. Performance and Payment Bonds for General Contractor and Filed Subcontractors.
 - 3. Field engineering; photographic documentation.
 - 4. Coordination; project management.
 - 5. Preparation of schedule and periodic updates.
 - a. If periodic updates of schedule are not performed in a timely manner, the amount shown on the Schedule of Values for this line item shall be forfeit.
 - 6. Temporary facilities.
 - 7. Construction aids, including staging, scaffolding, shoring.
 - 8. Cutting and patching; selective demolition
 - 9. Final cleaning.
 - 10. Punch list preparation and response.
 - 11. Closeout documents.
 - 12. Overhead.
 - 13. Other items of work as requested by the Architect or Owner.
- B. Work Covered in Divisions 2 through 50: Provide at least one separate line item for each Section of the Specifications. Section line items shall be further subdivided into separate line items as follows:
 - 1. Subdivide each line item into separate line items for individual floors of the project where applicable.
 - 2. Identify material costs separately from labor costs.
 - 3. Provide separate line items for the following where applicable:
 - a. Submittals.
 - b. Maintenance of as-built documents for mechanical and electrical work
 - c. Preparation of closeout documents
 - d. Operations and Maintenance Manuals;
 - e. Training
 - f. Other items of work as requested by the Architect or Owner.
 - 4. For mechanical and electrical work, provide the following additional separate line items where applicable:
 - 5. For each line item which has installed value of more than \$20,000.00 break down costs to list major products, components, or operations under each line.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 31 00: PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
 - 1. Project Documentation.
 - 2. Responsibility for coordination of the Work.
 - 3. Surveying and engineering.
- B. Related work includes, but is not limited to, the following work under other Sections:
 - 1. General requirements for submittals: Section 013300 - SUBMITTAL PROCEDURES.
 - 2. Coordination with Section 018113 - SUSTAINABLE DESIGN REQUIREMENTS.

1.3 COORDINATION

- A. General: The Contractor shall be responsible for the proper fitting of all work and the coordination of the operations of all trades, Subcontractors, material installers and equipment engaged upon the Work. He shall perform or cause Subcontractors to perform all cutting, fitting, adjusting and patching necessary to make the several parts of the Work come together properly and to fit the Work to receive or be received by that of other contractors.
- B. Project Supervision: The Contractor shall give his personal supervision to the Work and shall assign the following site staff for the Project:
 - 1. Full-time Superintendent: A superintendent licensed in the Commonwealth of Massachusetts, with the authority to act on behalf of the Contractor. The Superintendent shall supervise the Work at all times throughout the duration of the Project.
 - 2. Quality Control Monitor: A member of Contractor's full-time on-site staff assigned to monitor the quality of the Work. The Quality Control Monitor may also be assigned to oversee and document construction waste removal.
 - 3. The Contractor shall also provide an adequate staff for the proper coordination and expediting of the Work.
- C. Coordination with Subcontractors: The Contractor shall be in charge of the entire Work and shall be responsible for the prompt coordination of all trades, including his own forces and his various Subcontractors, as well as the Owner's separate contractors, if they are on the job during the Contractor's operations, and shall become fully familiar with all work required under the Contract.
 - 1. The above notwithstanding, each Subcontractor shall assume responsibility for the correctness and adequacy of his work. Each Subcontractor shall be responsible for and pay for all damage done by his work and his workers.
 - 2. No Subcontractor shall be permitted on the site without the Superintendent present to supervise the Work.
- D. Care shall be given to the proper scheduling, delivery, and installation of items to be built into rough

construction which will affect the latter portions of the Work, such as anchors, pipe sleeves, inserts, conduit, pipes, lugs, clips, brackets, braces, hangers, bolts, miscellaneous metal, and similar items. These items are not necessarily specified under the trade Section under which they are to be installed. The Contractor shall ascertain that all are properly installed in their correct locations at the proper time, so as to prevent cutting and patching of finished work.

- E. The Contractor shall be fully responsible for coordination of general construction work with that of Subcontractors for FIRE SUPPRESSION, PLUMBING, ELECTRICAL, HEATING AND VENTILATING, and all other specialized trades. He shall investigate, together with the Subcontractors involved, the routing of pipe, ductwork, and conduit with particular attention to interference of structural members, other pipes, ducts, and conduit cuts, headroom conditions, door and window openings and swings, pipe chases, and similar features of the building which may affect installation and proper functioning of such items.
- F. Changes in design locations which may be necessary in the routing of pipes and ducts, or in the location of any mechanical, electrical or other equipment or in the location of other building elements, shall be anticipated and made prior to installation. Additional compensation will not be allowed for costs incurred as a result of the Contractor's failure to anticipate the necessity for such changes.
- G. There shall be no change or variation in ceiling height, wall layout, shaft, chase, furring or other dimensions shown on Drawings without the specific written approval of the Architect.
- H. The Contractor's responsibility for the coordination of all work under the Contract shall be complete, and shall extend to all modifications in the Work, whether or not such modifications entail a change in the Contract Price. Where the Contract Documents allow an optional material or method of performing a portion of the Work, or where the Contractor is ultimately allowed or directed to perform a part of the Work using a substitute material or method, the Contractor shall provide all other coordination and additional work that such change necessitates, without any additional cost to the Owner.

1.4 FIELD ENGINEERING REQUIREMENTS

- A. The Contractor's attention is directed to the fact that Drawings have been prepared based on the assumption that all existing walls are set in orthogonal relationship to each other. The Contractor will be responsible for verifying the precise angle between existing walls, and bring to the attention of the Architect any conditions that deviate from orthogonal.

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

SECTION 01 31 19: PROJECT MEETINGS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
 - 1. Organizational meetings.
 - 2. Project meetings.
 - 3. Pre-Installation conferences
 - 4. Post-construction meetings
- B. Related work includes, but is not limited to, the following work under other Sections:
 - 1. Requirements for construction schedules: Section 013200-CONSTRUCTION PROGRESS DOCUMENTATION.

PART 2 - PRODUCTS

2.1 ORGANIZATIONAL MEETINGS

- A. General: The Owner will schedule pre-construction organizational meetings, periodic project meetings, specially called meetings throughout the progress of the Work, and post-construction meetings. Representatives of the Contractor shall attend all such meeting. Subcontractors shall attend only if requested by the Architect or the Owner.
- B. Pre-Construction Meeting: Immediately following award of Contract, the Architect will call one or more preliminary organizational meetings, during which detailed procedures will be worked out for submission and review of Shop Drawings and samples, format and extent of the Progress Schedule and Schedule of Values, format and methods for progress payment requisitions, channels of communication between Owner, Architect's and Contractor's personnel, and other routines to be followed during construction. The Architect will then issue a directive summarizing such procedures.
- C. Long Lead Item Submittal Review Meeting: As soon as practical after contract signing and submittal of all long lead items, coordinate a meeting with the Owner, Architect, and Subcontractors to expedite the coordination, review, and approval of long lead items. Refer to Section 011100 – SUMMARY OF WORK, Paragraph 1.11.5.

2.2 PROJECT MEETINGS

- A. The Architect shall schedule and meet regularly with the Owner and the Contractor at the site of the Work during the course of the Contract for the purpose of progress review, coordination of Shop Drawing schedules, sample submittals, and other items of work requiring such coordination. The dates of such meetings shall be as mutually agreed upon between the Owner, the Contractor and the Architect. Contractor shall require Subcontractors to attend such meetings if requested by the Architect.

- B. The Architect will take minutes of such meetings and will distribute copies of the minutes to all concerned.
- C. Contractor's and Subcontractor's representatives attending such meetings shall include the job superintendent or other responsible party approved by the Architect. Such representatives shall be empowered to make, at these meetings, definite decisions binding upon their respective employers regarding all matters pertaining to work under this Contract.
- D. The Contractor shall furnish the Owner and the Architect, in writing, the names, addresses, and telephone numbers of Contractor's and principal Subcontractors' personnel to be contacted in the event of an out-of-hours emergency at the building site. He shall also maintain a similar list readily visible from the outside of the field office.

END OF SECTION

SECTION 01 32 00: CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 SUMMARY

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
1. Time for Completion and Liquidated Damages.
 2. Sequencing requirements.
 3. Phasing requirements.
 4. Requirements for scheduling closeout activities.
 5. Critical Path Method Schedule preparation and submission.
 6. Photographic documentation of construction.
 7. Monthly reports to the Owner.
- B. Related work includes, but is not limited to, the following work under other Sections:
1. Section 011400 - WORK RESTRICTIONS: Hours of work and related scheduling criteria.
 2. Section 012400 - SCHEDULE OF VALUES: Allocation of portions of the Work as line items in applications for payment.
 3. Section 013100 - PROJECT MANAGEMENT AND COORDINATION: Contractor responsibility for coordinating the Work.
 4. Section 013119 - PROJECT MEETINGS: Scheduling construction-related meetings.
 5. Section 013300 - SUBMITTAL PROCEDURES: Coordination of submittal schedule with construction.
 6. Section 014000 - QUALITY REQUIREMENTS: Special sequencing requirements required for inspection of building components prior to concealment.
 7. Section 017700 - CLOSEOUT PROCEDURES: Requirements for Substantial Completion and Final Completion.

1.3 SUBMITTALS

- A. Complete and Detailed Construction Schedule: Within 14 calendar days following receipt of the Notice to Proceed, detailed schedule, to show entire schedule for entire construction period.
1. Acceptance of the Complete and Detailed Construction Schedule by the Owner, Project Manager and Architect shall be a prerequisite to certification of the second Application for Payment.
- B. Monthly Schedule Update: With each monthly Application for Payment, submit a schedule up- date of the accepted Complete and Detailed Construction Schedule accompanied by a written narrative reporting on the progress of the work.
1. Acceptance of the Updated Schedule each month by the Owner and Architect shall be a prerequisite to certification of the monthly Application for Payment.
- C. Daily Construction Field Reports: Submit the current week's field reports to the Architect at the end of each week. (Electronic submission is acceptable.)
- D. Special Reports: Submit special reports of unusual events at the site directly to the Architect, on the

day of the occurrence. Distribute additional copies of report to parties affected by the occurrence.

- E. Construction Photographs: Submit construction photographs as specified herein.

1.4 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

- A. It is understood and mutually agreed, by and between the Contractor and the Owner, that there is an established date of beginning and the time for completion of this Contract, and it is further mutually understood and agreed that the Work embraced in this Contract shall be commenced by the date specified therein.
- B. The Contractor agrees that said Work shall be prosecuted regularly, diligently, and uninterruptedly at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the Work in each phase described herein is a reasonable time for the completion of the same, taking into consideration the usual industrial and climatic conditions prevailing in this locality.
- C. It is further agreed that time is of the essence of each and every portion of the Contract and of the Contract Documents wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the Contract an additional time is allowed for the completion of any work, the new limit fixed by such extension shall be of the essence of this Contract.

PART 2 - PRODUCTS

2.1 CRITICAL PATH METHOD SCHEDULE (CPM) GENERAL

- A. The purpose of the Construction Schedule shall be to:
 - 1. Assure adequate planning, scheduling and reporting during execution of the work by the Contractor;
 - 2. Assist the Contractor, Architect, and Owner in monitoring the progress of the work and evaluating proposed changes to the Contract and the Construction schedule;
 - 3. Assist the Owner and Architect and the Contractor in the preparation and evaluation of the Contractor's monthly progress payments.
- B. The Construction Schedules shall employ the Critical Path Method (CPM) for the planning, scheduling and reporting of the work to be performed under the contract and shall meet the following requirements:
 - 1. The type of schedule shall be time scaled Precedence Diagramming Method (PDM) with Finish to Start with zero (0) lag dependency relationship.
 - 2. Activity duration shall be in units of whole working days and shall be limited to a minimum of one (1) and a maximum of twenty (20) working days for each activity.
 - 3. The schedules and the corresponding completion dates shall meet the contract duration (remaining contract duration for the monthly updates) of the project. Failure by the Contractor to include any element of work required for performance of the Contract shall not excuse the General Contractor from completing all work within the Contract Time. Under no circumstances, shall the Contractor be entitled to an equitable adjustment in the event of failing to achieve an early completion schedule.
 - 4. Proposed durations assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity, utilizing the appropriate workday calendar.
 - 5. The acceptance of the Construction Schedule shall not relieve the Contractor of responsibility for

timing, planning and scheduling of the Work, nor impose any duty on the Architect or Owner with respect to the timing, planning or scheduling of the Work.

2.2 COMPLETE AND DETAILED CONSTRUCTION SCHEDULE

- A. Prepare and submit a comprehensive, fully developed Complete and Detailed CPM Construction Schedule within 14 days after Notice to Proceed.
 - 1. Schedule shall be neatly organized and plotted time scaled from left to right on Project standard size sheets with suitable notation relating the interface points among sheets.
 - 2. The General Contractor's Schedule shall consist of, but not be limited to, the following:
 - a. Proposed procurement, submittal preparation, submittal review, fabrication & delivery, construction, testing, commissioning, and permitting activities.
 - b. Proposed durations for activities.
 - c. Proposed sequencing of activities (predecessors & successors).
 - d. Milestone events as required by the Contract Documents and Division 1 of the Specifications.
 - 3. The following shall be depicted on the Schedule for each activity:
 - a. Concise description of the work represented by the activity. The work related to each activity shall be limited to one work trade and one area. All descriptions shall include area designations.
 - b. In developing the Schedule, the Contractor shall be responsible for assuring that subcontractor and supplier work at all tiers, as well as its own work, is included in the Schedule.
 - c. The Schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. The Contractor shall be responsible for assuring that all work sequences are logical and the Schedule shows a coordinated plan of the work.
 - d. Each activity shall have only one responsible party and will be coded accordingly.
 - 4. For the purposes of utilizing schedule targets, activity IDs shall not be modified.
 - 5. The schedule shall employ retained logic.
 - 6. Any float suppression techniques identified shall be corrected by the Contractor.
 - 7. The Contractor shall utilize logic, durations, and appropriate calendar assignment to forecast dates, not activity constraints.

2.4 MONTHLY SCHEDULE UPDATE REPORTS

- A. Monthly Schedule Update Report: Evaluate the status of the work as of the 25th of each month to show actual progress and to identify problem areas. Update the Complete and Detailed Construction schedule and print a schedule summary. Include approved Change Orders and Construction Change Directives within the updated schedule
- B. The Contractor shall furnish sufficient forces, offices, facilities and equipment at no additional cost to the Owner, and shall work such hours as necessary, within any local restrictions or agreements incorporated into the Contract, to ensure the prosecution of the work in accordance with the current monthly Project Schedule Update. Should the monthly update show that the Contractor is fourteen (14) or more work days behind schedule, the Contractor shall prepare a Recovery Schedule at no additional cost to the Owner explaining and displaying how the General Contractor intends to reschedule the work in order to regain compliance with the contract. The provision of this paragraph may include the Contractor increasing the hours of work, the number of shifts, overtime operations and/or the amount of construction plant and equipment or working on Saturdays, Sundays and holidays, within agreed working hours or variance granted, provided the General Contractor gives reasonable notice to the Owner.

2.5 RECOVERY SCHEDULE

- A. When directed by the Owner/Architect, the Contractor shall develop a Recovery Schedule with a detailed narrative for all the remaining work based on the last accepted Monthly Schedule Update. The Recovery Schedule shall represent the Contractor's current work sequence plan and shall forecast completion of the remaining work within remaining contract durations. The Recovery Schedule narrative shall enumerate the Contractor's work plan including increases to crew sizes and/or extended shifts to complete work within remaining contract durations. The Recovery Schedule shall conform to requirements set forth in Paragraph 1.04 (Complete and Detailed Construction Schedule).
- B. The Contractor shall be responsible to develop mitigation measures for all delays, regardless of the responsibility for the delays, and to identify all time and cost impacts to the work associated with those mitigation measures. Whenever it is possible for the Contractor to mitigate delay without added cost, the Contractor shall do so. The Contractor shall mitigate all delays as efficiently and economically as possible, with the objective of minimizing both the time and cost impact of the delay, regardless of the responsibility of the delay. No cost impact will be allowed for mitigation of delays caused solely by the Contractor or his/her subcontractors.
- C. Unless circumstances otherwise require, the Contractor shall not pursue mitigation action for which it expects the Owner/Architect to be liable, prior to notifying the Owner/Architect and receiving Owner/Architect authorization to proceed with the mitigation action. Any action taken by the Contractor prior to receiving approval from the Owner/Architect shall be at the Contractor's risk.

2.6 DAILY CONSTRUCTION REPORTS

- A. Prepare a daily construction report, recording events at the site. Report the following information, as applicable.
 - 1. List of subcontractors at the site, and approximate count of personnel.
 - 2. High and low temperatures, general weather conditions (when exterior work is in progress)
 - 3. Meetings and significant decisions.
 - 4. Accidents, unusual events, and emergency procedures.
 - 5. Stoppages, delays, shortages, losses.
 - 6. Meter readings and similar recordings.
 - 7. Services connected, disconnected.
 - 8. Orders and requests of governing authorities.
 - 9. Change Orders received, implemented.
 - 10. Equipment or system tests and start-ups.
 - 11. Partial Completions, occupancies.
 - 12. Substantial Completions authorized.
- B. At the end of each week, compile the daily reports for the preceding week. Have the Contractor's Superintendent sign the daily reports and prepare a brief outline of the Work anticipated for the coming work week. Submit one copy to the Owner and one copy to the Architect.

2.7 CONSTRUCTION PHOTOGRAPHS

- A. Digital Images: Provide images in JPG format, produced by a digital camera with minimum sensor size of 8 megapixels, and at an image resolution of not less than 3200 by 2400 pixels.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.

- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.

- D. Preconstruction Photographs: Before commencement of any work on site, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take a minimum of 20 photographs to show existing conditions adjacent to property before starting the Work.
 - 3. Take a minimum 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
 - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

- E. Periodic Construction Photographs: Take 20 photographs monthly, coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
 - 1. Take general photographs to document progress.

- F. Final Completion Construction Photographs: Take 20 color photographs after date of Substantial Completion for submission as project record documents. Architect and Owner will inform photographer of desired vantage points.

PART 3 - EXECUTION

3.1 SCHEDULING THE WORK

- A. The Contractor shall perform the Work in accordance with the approved CPM Schedule.
 - 1. If during the progress of the job the Contractor misses a start date of an activity on the critical path, the Contractor shall, within five (5) working days, advise the Architect in writing of action proposed to bring the Work up to schedule, and shall submit a revised CPM Schedule indicating such action, together with a typed list of such revisions.
 - 2. If the Contractor fails to submit a revised schedule within the specified time or if the Owner or Architect is not convinced of the efficacy of the measures proposed, the Owner may, at its option, require the Contractor to accelerate the progress of the Work, without additional cost to the Owner, by increasing the work force or the hours of work, or by other reasonable means approved by the Architect.

END OF SECTION

SECTION 01 33 00: SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
1. Submittal schedule
 2. Product data
 3. Shop drawings
 4. Samples
 5. Colors and finishes
 6. Calculations
 7. Informational submittals
 8. Action on submittals.
 9. Substitution requests.
- B. Related work includes, but is not limited to, the following work under other Sections:
1. Availability and restrictions for use of electronic copies of Contract Document: Section 011400 - WORK RESTRICTIONS.
 2. Specific requirements for submittal of construction schedules: Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION.
 3. Specific requirements for submittal of schedule of values: Section 012400 - SCHEDULE OF VALUES.
 4. Requirements for electronic documentation: Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
 5. Submittal of final record drawings and other documents: Section 017839 - PROJECT RECORD DOCUMENTS.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action. Action submittals include product data, shop drawings and samples.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals include calculations and other informational submittals described in this Section.
- C. Substitutions: Changes in products, materials, equipment and methods of construction from those required by the Contract Documents, as proposed by the Contractor and not considered "or equal". Refer to definition of "or equal" in Section 011100 - SUMMARY OF WORK.

1.4 SUBMITTALS

- A. Submittal Schedule:
1. Within 3 calendar days after signing the Agreement, prepare and submit a list of all items with a lead time of 6 weeks or longer.

2. Within 14 calendar days after signing the Agreement, provide complete submittals for all items with lead times of 6 weeks or greater. Prepare and submit for the Architect's approval a schedule of all other Shop Drawings, Product Data and Samples required to be submitted for the Work.
 - a. The schedule shall indicate by trade the date by which final approval of each item must be obtained, and shall be revised as required by conditions of work, subject to the Architect's approval.
 - b. The schedule shall be derived from the Contractor's CPM Schedule.
 3. Submittal review of these long lead items will be expedited according to Section 011100 – SUMMARY OF WORK, Paragraph 12.1.B.5.
 4. The Architect's review, including Consultant's review period, will not exceed 21 working days (excluding weekends & holidays) from the date on which the Architect receives the submission. Contractor shall strictly adhere to the established dates set forth by the Schedule of Submittals specified above in paragraph 2.01 A.
 5. Each submittal shall be made no later than 60 days prior to the time for incorporation of the item into the Work, or earlier under the following conditions:
 - a. As required to furnish and deliver to the site the specific item or items required, with sufficient time to allow proper examination and review of such submittals.
 - b. If the item in question is to be incorporated in the work prior to the expiration of 60 calendar days from the time of execution of the Contract, the aforesaid written notice shall be submitted to the Architect immediately following the execution of the Contract.
 - c. Substitutions: Each request for a substitution shall be made no later than 90 days prior to the time for incorporation of the item into the Work.
 6. No item, material, article, system or piece of equipment requiring approval of the Architect shall be ordered or installed until such approval has been obtained.
 7. Contractor shall provide the Owner and Clerk of the Works with software and training for programs used to schedule, and track Shop Drawings, Samples, and RFI's.
- B. Product List for Color Selection: To facilitate the preparation of the color schedule, the Contractor shall submit, within thirty (30) calendar days following date of Award of Contract, a list of the names of the manufacturers whose products he proposes to use.
1. List products for which color, finish, pattern, texture, or other related information is a consideration, including, but not limited to the following:
 - a. Exterior materials: Face brick; exterior concrete masonry units; factory-finished metal siding; factory finish for doors, windows and louvers.
 - b. Casework finishes: Solid and veneer wood with transparent finish; plastic laminate.
 - c. Interior finishes: Ceramic tile, acoustical ceiling tile, resilient flooring, carpet, paint.
 - d. Specialties available in a choice of colors: Toilet partitions; lockers; operable panel finishes.
 - e. Other items for which the above properties affect the design.
 2. Products listed shall be as specified, unless substitution has been approved.
 3. Long lead items shall be submitted in accordance to Section 011100 – SUMMARY OF WORK, Paragraph 12.1.B.5.
- C. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use facsimile of form provided at end of Section.
 2. Documentation: Show compliance with requirements for substitutions listed on the Substitution Request form, and additional requirements as may be requested by the Architect or as otherwise applicable.

- D. Product Data, Shop Drawings, Samples, Schedules and other Submittals: Refer to individual Specification Sections for submittals required.
- E. Confirmation of contract between Contractor and printing company for reproduction of shop drawings as specified in this Section.

PART 2 - PRODUCTS

2.1 SUBMITTAL PREPARATION, GENERAL

- A. Preparation of Submittals: To receive consideration by the Architect, submittals shall be accompanied by a letter of transmittal. Each submittal shall contain the following information on the Drawing title block or a cover sheet stapled to the submittal:
 - 1. Project identification
 - 2. Architect's name
 - 3. Date of preparation of submission, and of revision if applicable
 - 4. Submittal number and title of item the Drawings refers to
 - 5. Architect's Drawing numbers and Specification paragraph number used as a reference in preparing submittal
 - 6. Contractor's and Subcontractor's names, and addresses and phone numbers
 - 7. Name of person or firm preparing Drawings
 - 8. Statement on stamp of approval by the Contractor, signifying that he has seen and examined the submittal and that requirements of the General Conditions have been complied with
- B. Each submittal cover sheet shall contain a clear space approximately 80 square inches for stamps and Architect's comments. Each drawing shall contain a similar space as an additional border on the right or bottom.
- C. Distribution:
 - 1. Architect will determine the system for submittal distribution at the kick-off meeting. Process will not require more than 3 hard copies of each submittal.

2.2 PRODUCT DATA

- A. Manufacturers' Product Literature: For standard manufactured items, submit manufacturer's catalog sheets with illustrated cuts of the items to be furnished.
 - 1. Include scale details, sizes, dimensions, performance characteristics, capacities and other pertinent information.
 - 2. Each submittal of product data shall be accompanied by an appropriate transmittal form with specific reference to the applicable paragraph in the Specifications.
 - 3. Indicate clearly on such printed matter which of several items is being submitted for approval.
- B. If catalog cuts of standard manufactured items show different types, options, finishes, performance requirements, or other variations, those features that the Contractor proposes to furnish shall be clearly circled or otherwise indicated, and all irrelevant diagrams, notes, or other information deleted or canceled.
 - 1. If any variations from the catalog description are proposed or required, such variations shall be clearly noted on the cut by the Contractor.
 - 2. Wiring diagrams shall be produced to address specific project requirements. Catalog cuts of wiring diagrams will not be acceptable.

2.3 SHOP DRAWINGS

- A. The Contractor shall prepare shop drawings showing such features as required by the Technical Specifications Sections, to demonstrate an understanding of the particular conditions unique to this Project.
 - 1. Prepare shop drawings at a scale of at least twice the scale of contract drawings showing the same work.
 - 2. Reproduction of Contract Documents in any form will not be accepted for use as Shop Drawings, unless specifically allowed in writing by the Architect for a particular portion of the Work.
 - 3. Refer to Section 011400 - WORK RESTRICTIONS for permissible use of electronic documents for the purpose of preparation of shop drawings. Use of Project Electronic Files for shop drawing preparation will be subject to the requirements specified in that Section.
 - 4. Shop drawings must be project specific.
- B. Shop Drawings related to various units comprising a proposed assembly shall be submitted simultaneously so that such units may be checked individually and as an assembly.
- C. Shop Drawing Distribution:
 - 1. Shop Drawings shall be submitted through the Contractor directly to the applicable consultant and the Architect.
 - 2. Drawings submitted directly from Subcontractors, manufacturers or vendors, or directly to the Architect's consultants, will be returned to the Contractor without action.
 - 3. The Architect will forward copies of submittals to the Clerk of the Works when so re-quested for their use. However, it is the responsibility of only the Architect and their Consultants to review and respond to submittals.
- D. Each drawing and print shall have a clear space approximately 80 square inches as an additional border on the right or bottom for stamps and Architect's comments.
- E. Shop Drawings shall clearly indicate all details, sectional views, arrangements, working and erection dimensions, kinds and quality of materials and their finishes, and other information necessary for proper checking and for fabrication and installation of the items, and shall include all information required for making connections to other work and/or adjacent materials.
- F. If any information on previously submitted Shop Drawings, aside from notations made by the Architect is revised in any way, such revision shall be circled or otherwise graphically brought to the Architect's attention. If approved Drawings are subsequently revised, they shall be resubmitted to the Architect with all revisions clearly marked for the Architect's attention. Whenever drawings are revised, the latest revisions shall be circled or otherwise indicated to distinguish them clearly from all previous revisions (and from the information on the original drawing).

2.4 SAMPLES

- A. Submit samples as required under the various Sections of the Specifications. Each sample shall be accompanied by a transmittal and cover sheet as required for all submittals.
- B. Before submitting samples, consult with Architect to determine whether samples are to be submitted to Architect's office, field, or other location.
- C. All samples shall be submitted in triplicate, unless otherwise specified or directed by the Architect.

- D. Samples may be submitted to Architect directly from manufacturers, vendors, suppliers, Subcontractors, or others, but a separate transmittal letter shall be submitted through the Contractor in each such case.
- E. Approved samples of major or expensive items or assemblies, if in good condition and meeting all requirements of the Contract, may be properly marked for identification and used in the Work, provided that all shipping and handling charges are paid by the Contractor.
- F. Each sample shall have a label indicating the material represented, its place of origin, and the names of the producer, the Architect, the Contractor, the Subcontractor and the building or Work for which the material is intended. Samples shall be marked to indicate the Drawing numbers or Specification Paragraph requiring the materials represented.
- G. Approval of samples for color, texture, and other aesthetic qualities shall not be construed as approval of other characteristics.
- H. Approved samples, unless specifically stated by the Contractor as slated for incorporation in the Work, will be kept on file (and accessible for inspection) by the Architect until Final Acceptance of the Project. Any sample not reclaimed by the Contractor within thirty (30) days after Substantial Completion of the Project will be considered unclaimed material, and may be disposed of by the Architect.

2.5 COLORS AND FINISHES

- A. The Architect will prepare a master color schedule indicating the required color, finish, pattern, material, texture, and other pertinent information in connection with interior and exterior finishes.
- B. Color chips shall be submitted for all items having color unless otherwise directed or approved by the Architect. Upon the expiration of such 45-day period, the Architect will proceed with color selection and preparation of final color schedule.
- C. The Architect will select the colors and finishes of a manufacturer within the framework of the Specifications, for each item where the Contractor fails to submit the name of a specific manufacturer within the allotted time, and the Contractor shall provide such materials without additional compensation.

2.6 CALCULATIONS

- A. Calculations Based on Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, submit calculations demonstrating that products and systems comply with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents.
 - 2. Include list of codes, loads, and other factors used in performing these services

2.7 INFORMATIONAL SUBMITTALS

- A. General: Informational submittals comprise written information that does not require Architect's responsive action. Submit to the Architect two copies, or more if specified, for each informational submittal. The Architect will distribute copies to the Owner for their records.
- B. Informational submittals required for the Work include, but are not limited to, the following:
 - 1. Storm Water Pollution Prevention Plan Documentation, as specified in Section 011400 - WORK RESTRICTIONS
 - 2. Calculations for Contractor-engineered work, as specified in particular specification sections in Divisions 02 through 50.
 - 3. Research/evaluation reports and test data as specified in particular specification sections in Divisions 02 through 50.
 - 4. Certifications and other qualification data, as specified in particular specification sections in Divisions 02 through 50.
 - 5. Maintenance data, as specified in particular specification sections in Divisions 02 through 50.
 - 6. Confirmation of contract with printing company as specified in this Section.

PART 3 - EXECUTION

3.1 CONTRACTOR ACTION ON SUBMITTALS

- A. Should the Architect in checking shop drawings or other submittals make changes which the Contractor deems will increase the Contract Price, the Contractor shall so inform the Architect in writing within fourteen (14) days following receipt of the checked submittals and prior to starting fabrication of the item or items. Failing this, the Contractor shall be deemed to have waived all claims for extra compensation for the work involved.
- B. Notes or other information on submittals that are contrary to provisions of the Contract Documents shall be deemed to be addressed to the applicable Contractor, Subcontractor, material supplier or other parties involved, and shall have no force or effect with respect to this Contract, even though the Shop Drawing or Sample involved is approved by the Architect. In particular the terms "By Others", "N.I.C." or words of similar meaning and import on submissions shall not be deemed to imply that the referenced items are to be omitted from this Contract.
- C. The Contractor shall obtain and distribute copies of approved Shop Drawings and other Submittals to his subcontractors and material suppliers needing such information, at no additional cost to the Owner.
- D. The Contractor shall keep on the site, in good order, a complete up-to-date set of all approved Shop Drawings and other Submittals.
- E. Contractor shall assume full liability for delay attributed to insufficient time for delivery and/or installation of material or performance of the Work when approval of pertinent Shop Drawings is withheld due to failure of the Contractor to submit, revise, or resubmit Shop Drawings in adequate time to allow the Architect reasonable time, not to exceed twenty-one (21) working days (excluding weekends and holidays), for normal checking and processing of each submission and resubmission. The Architect will not be limited to twenty-one (21) days when the Shop Drawing Schedule has not been submitted or is not current.

3.2 ARCHITECT ACTION ON SUBMITTALS

- A. Product Data and Shop Drawings: After reviewing product data submittals, the Architect will mark each submittal with one of the following responses
1. The Architect will annotate the transparency or an original copy and apply a stamp including the following information: "Reviewed as required by the Construction Contract Documents and approved, but only for conformance to the design concept of the Work, and subject to further limitations and requirements contained in the Contract Documents."
 2. "Rejected". Two copies of each rejected submittal will be returned to the Contractor. Rejected copies shall be resubmitted in the same manner until approval is obtained.
 3. The stamp will also contain notes indicating possible actions, namely; "rejected"; "revise and resubmit"; and "furnish as corrected". Architect will check one of the actions.
 4. Corrections or comments made on the submittals during this review shall not relieve Contractor from compliance with requirements of the Contract Drawings and Specifications. This check is only for review of general conformance with the design concept of and general conformance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.
 5. For Submittals marked "Rejected", or "Revise and Resubmit", the Architect will have prints made from the marked reproducible Drawings at the Contractor's expense. Such prints shall be used for record purposes and for comparison with subsequent resubmissions. One will be retained by the Architect, one furnished to the applicable consultants, if any, and the transparency returned to the Contractor. Such procedures shall be followed until the Shop Drawing is marked "Furnish as Corrected", or "Reviewed as required by the Construction Contract Documents and approved, but only for conformance to the design concept of the work, and subject to further limitations and requirements contained in the Contract Documents."
 6. Submittals marked "Furnish as Corrected" shall be treated in the same manner as Drawings marked "Reviewed as required by the Construction Contract Documents...and requirements contained in the Contract Documents." The Architect's comments shall be considered part of the original Drawings. Should the Contractor disagree with such comments, he shall so notify the Architect in writing within fourteen (14) days after receipt of such Drawings and before commencing work on the items in question. Failing this, the Contractor shall be deemed to have accepted full responsibility for implementing such comments at no additional cost to the Owner.
 7. Transparencies for all Drawings marked "Furnished as Corrected" or "Reviewed as required by the Construction Contract Documents..." will be returned to the Contractor.
 8. Before the transparency is returned by the Architect with the stamp "Reviewed as required by the Construction Contract Documents..." or "Furnish as Corrected", the Architect will have made at the Contractor's expense, four (4) prints of the corrected original for the Architect's and Owner's use.
- B. Informational Submittals: Architect will review each informational submittal and will review it for general compliance with submittal requirements
1. Architect will process and distribute each informational submittal as for other submittals.
 2. Compliant informational submittals will be marked "Reviewed" and stamped copies will be distributed to Owner, Clerk of the Works and Contractor.
 3. Informational submittals that do not comply with submittal requirements specified herein and in the section whose work they cover will be returned without any action or stamp. Re-submittal will be required.

- C. Repeated Re-submittals: The Architect will review the initial submittal for each product, and one re-submittal if revisions are required.
 - 1. If the first re-submittal is rejected or requires further revision, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform review of an extensive number of repeated submittals, until a submittal for that product is accepted by the Architect with no need for further revision.
 - 2. Refer to Section 011400 - WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible to the Owner for costs for Additional Services of the Architect.

3.3 SUBSTITUTIONS

- A. Definition: Substitutions are changes proposed by Contractor for products, materials, equipment, and methods of construction differing from those required by the Contract Documents.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - 1. Substitution is requested by completing a copy of Form 013301 - SUBSTITUTION REQUEST FORM, attached to the end of this Section.
 - 2. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - 3. Requested substitution does not require extensive revisions to the Contract Documents.
 - 4. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - 5. Substitution request is fully documented and properly submitted.
 - 6. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - 7. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - 8. Requested substitution is compatible with other portions of the Work.
 - 9. Requested substitution has been coordinated with other portions of the Work.
 - 10. Requested substitution provides specified warranty.
 - 11. If requested, substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - 12. Due to the project schedule requirements, substitutions submissions that are incomplete will be rejected.
- C. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 calendar days of receipt of request.
 - 1. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- D. Review of Substitution Requests: The Architect will review Substitution Requests that are submitted in accordance with the requirements of this section, and are shown to be of benefit to the Project.
 - 1. If a request for substitution is incomplete, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform additional review, until the substitution has been either accepted with no need for further revision, or rejected.

2. If a request for substitution is shown to be of benefit to the Contractor only and not to the Project, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform review, redesign or coordination due to such substitution.
3. Refer to Section 011400 - WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible to the Owner for costs for Additional Services of the Architect.

END OF SECTION

Attachment: Form 013301 - SUBSTITUTION REQUEST FORM

Attachment: Form 013302 – SUBMITTAL COVER SHEET

FORM 01 33 01: SUBSTITUTION REQUEST FORM

Project: 6th Floor Office Renovation, Arlington High School

To: Turowski2 Architecture, Inc.

We hereby submit for your consideration the following product as a substitution for the item specified for the above referenced project:

Drawing Number: _____ Drawing Title: _____

Specification Section: _____ Section Title: _____

Paragraph: _____ Specified Item: _____

Proposed Substitution: _____

Attach complete information on changes to Drawings and Specifications, including related work on other Drawings and under other Sections of the Specifications necessary for the proper installation of the pro- posed substitution, including proper coordination and finishing.

Submit with request complete Product Data, samples and other data necessary to substantiate that the proposed item is equal to or exceeds the specified item in all respects. Include a comparison chart showing material features and properties of the specified item and the proposed substitute, paying particular attention to requirements specifically mentioned in the Specifications or shown on the Drawings, and guarantee/warranty information. Clearly mark manufacturer's literature to indicate equality in performance. In the case of operating equipment or systems, provide information as to servicing and maintenance requirements, and anticipated service life in the indicated application.

Fill in the blanks below (attach additional sheets as necessary):

A. Does the substitute affect dimensions shown on the Drawings: Yes No
(if yes, clearly indicate changes on enclosures)

B. Will the undersigned pay for changes to the building design, including architectural/engineering detailing costs caused by the requested substitution: Yes No
(if no, please explain)

C. What effect does the substitution have on other Contracts or other trades? _____

D. What effect does the substitution have on construction schedule? _____

E. Manufacturer's warranties of the specified and proposed items are: Same Different

Explain: _____

F. Itemized comparison of specified item with proposed substitute is attached.

I. This substitution will amount to a credit or extra cost to the Owner of: _____ Dollars

(\$ _____). Notes:

Submission of this form by the Contractor will not require the Owner to accept the proposed substitution unless the substituted product or system meets the requirements of Massachusetts General Law, Chapter 30, Section 39M and is acceptable to the Architect.

The Owner's acceptance of any substitution will not change the Contract Price, unless the Owner, Contractor and any other required parties execute a Change Order in accordance with the terms and provisions of the Contract Documents.

Refer to Section 013300 - SUBMITTAL PROCEDURES, for additional requirements for the submittal and processing of substitution requests.

Submitted By: _____
(signature)

Title: _____

Firm: _____

END OF FORM

SUBMITTAL COVER SHEET

For Architect's Use	
Submittal #	
Date Received	
Resubmission #	

Project		Date	
General Contractor			
Filed Sub-Contractor (If applicable)			
Spec Section #		--	Description

Submittal Contents

Product (List each product individually)	Spec Reference # (i.e. 2.1.a)	Product Data	Shop Drawings	Test Reports	EMBC Form	Substitution Form	Samples	Maintenance Data	Warranty	Installation Data	Other

Contractor to provide stamp signifying that s/he has seen and examined the submittal and that the requirements of the Contract Documents have been fully complied with.

Architects' Stamp

SECTION 01 40 00: QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. This Section includes administrative and procedural requirements for
 1. Quality assurance.
 2. Quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 2. Specified tests, inspections, and related actions do not limit Contractor's other quality- assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 3. Requirements for Contractor to provide quality assurance and control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related work includes, but is not limited to, the following work under other Sections:
 1. Section 019113 - COMMISSIONING REQUIREMENTS/PLAN
 2. Section 019119 - EXTERIOR ENVELOPE COMMISSIONING PLAN

1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Reports: Prepare and submit certified written reports that include the following:
 - 1. Date of issue.
 - 2. Project title and number.

3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and re-inspecting.
- C. Permits, Licenses, and Certificates: For 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, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

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

- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Coordinate the work of multiple subcontractors as needed to build complete mockups of multi-component systems.
 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's approval of mockups before starting work, fabrication, or construction. a. Allow seven days for initial review and each re-review of each mockup.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed, unless otherwise indicated.

- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 50.

1.7 QUALITY CONTROL – OWNER RESPONSIBILITIES

- A. General: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Testing, inspections and commissioning performed by the Owner or the Owner's agents in no way reduce the responsibility of the Contractor to meet performance requirements, descriptive criteria and all other requirements of the specifications, nor do these activities on the part of the Owner relieve the Contractor from performing Quality Assurance and Quality Control measures specified.

- B. Tests and Inspections: The Owner reserves the right to employ consultants and testing agencies to test the performance of the Work and to inspect the Work for conformance with the Contract Documents.
 - 1. Notice for Testing: The Contractor shall give the Owner a minimum 24-hour notice when installations that require testing are ready for testing or inspection.
 - a. Earlier notice shall be given where specified in a given technical section of the Specifications.
 - b. If the Owner's testing agency arrives at the site to test the performance of the work, and determines that the installation is not ready for testing or inspections, then the Contractor shall be responsible for the costs of the testing agency's site visit
 - 2. Availability of Test Results: The results of such tests and inspections will be made available to the Architect and Contractor.
 - 3. Correction of Work:
 - a. Where results demonstrate deficiencies in the Work, the Contractor shall take all actions necessary to correct the Work in a timely manner at their own expense.
 - b. When the Contractor considers the Work to be corrected, further tests and inspections will be performed by the Owner's consultants and testing agencies at the Contractor's expense.
- C. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
- D. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

1.8 QUALITY CONTROL – CONTRACTOR RESPONSIBILITIES

- A. Tests and inspections not explicitly assigned to Owner are the Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 1 Section "Submittal Procedures."
- C. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Does not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. Schedule times for tests, inspections, obtaining samples, and similar activities.
- G. Examination of Site and Documents:
1. All bidders are required to visit the site and examine all contract documents before submitting a bid. Bidders shall inspect and be familiar with conditions under which work will be carried out. Neither the Owner nor the Architect shall be responsible for errors, omissions, and/or charges for extra work arising from the Contractor failing to familiarize him/herself with the contract documents or existing conditions. By submitting a bid, the bidder attests that he/she has examined the sites and contract documents, is familiar with the requirements of both, and that the intent of the drawings is clear.
 2. The School is open to bidder's examination as indicated in the Invitation to Bid.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.

- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Section 017329 - CUTTING AND PATCHING.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01 50 00: CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.
- B. Temporary controls: Barriers, enclosures and fencing, protection of the Work, and water control.
- C. Construction facilities: progress cleaning, project signage, and temporary offices.
- D. Temporary staging and scaffolding.

1.2 RELATED SECTIONS

- A. Section 01700 - Contract Closeout: Final cleaning.

1.3 TEMPORARY ELECTRICITY

- A. The existing electrical service may be used as a source for the temporary power.
- B. Exercise measures to conserve energy.
- D. Permanent convenience receptacles may be utilized during construction.
- E. Provide adequate distribution equipment, wiring, and outlets to provide three phase branch circuits for power and lighting.

1.4 TEMPORARY LIGHTING

- A. Provide and maintain lighting for construction operations.
- B. Maintain lighting and provide routine repairs.
- C. Permanent building lighting may be utilized during construction, if returned to clean, new condition at end. Replace all lamps used for construction operations.

1.5 TEMPORARY HEAT

- A. Provide and pay for heating or cooling devices and heating or cooling as required to maintain specified conditions for construction operations.
- B. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

1.6 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Utilize ventilation equipment. supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.7 TELEPHONE SERVICE

- A. Provide cellular telephone service at the time of project mobilization, for use by the Contractor's authorized agents, Subcontractors, and the Project Representative.

1.8 TEMPORARY WATER SERVICE

- A. The Contractor may use water facilities at Arlington High School.

1.9 TEMPORARY SANITARY FACILITIES

- A. Subject to agreements for satisfactory daily maintenance with the Owner, the Contractor may use toilet facilities in the Arlington High School, as directed by the Owner.
- B. The Contractor shall maintain toilet facilities daily in clean and sanitary condition.

1.10 SAFETY AND PROTECTION

- A. Comply with applicable safety regulations, including ANSI Series A10, Safety Requirements for Construction and Demolition, and OSHA Part 1926, Construction Safety and Health Regulations.

- Provide barricades, fences, and other protection measures as required.
- B. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- C. Provide protection for plant life. Replace damaged plant life.
- D. Protect non-owned vehicular traffic, stored materials, site and structures from damage
- E. Storage of flammable materials shall not be allowed on the premises.
- F. Protect all conditions indicated to remain. Repair all damages to the satisfaction of the Owner.

1.11 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic from landscaped areas.

1.12 SECURITY

- A. Provide security and facilities to protect Work, and existing facilities, from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.13 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Remove waste materials, debris, and rubbish from site at reasonable intervals and dispose off-site.

1.14 PROJECT SIGNS

- A. A project Sign is not required for this project.

1.15 FIELD OFFICE

- A. Office: An area of a room in the 6th floor Shall be designated for contractor use for meetings, record drawings, submittals and other project management storage.
- B. Meeting Area: A room in the School Building will be designated by the School Administration for Project meetings.

1.16 PARKING

- A. The Contractor's work forces may park in an area as designated by the Owner.

1.17 STAGING AREA AND SECURE STORAGE

- A. Temporary staging area for rigging roof top unit into place will be coordinated with the Owner.
- B. An area in the School parking lot will be made available for storage trailers/ contractor vehicles that will be on site over night. Storage Trailers must be removed from the site on or before August 20, 2011

1.18 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work by the date of Substantial Completion.

1.19 STAGING AND SCAFFOLDING

- A. Except as otherwise indicated, the General Contractor shall furnish, erect and maintain all staging and scaffolding (exterior and interior) twelve (12) feet or over in height for all trades for their use during the construction of the building without charge to the trades for such use. The Contractor shall also furnish, erect and maintain all staging and scaffolding for his own use, during the construction of the building. Staging and scaffolding shall be of approved design, erected and removed by experienced stage builders and shall have all accident prevention devices required by State and Local Laws.
- B. The General Contractor shall erect such staging and scaffolding in sufficient time and in proper sequence and commence so as not to delay work. Subcontractors shall schedule and commence their work so that building progress is not delayed or obstructed once staging and scaffolding become available.
- B. Each subcontractor entering upon the work shall furnish, erect and maintain all staging and scaffolding under twelve feet (12') in height required for work under his/her work. On completion of this/her work, each subcontractor shall dismantle and remove such staging and scaffolding.

1.20 DUST CONTROL

- A. Except as otherwise indicated, the General Contractor shall furnish, erect and maintain temporary partitions, walk off mats, fencing and other items required to minimize the spread of mud, dust and debris within and in the vicinity of the work area, during the construction of the building. The General Contractor and each Subcontractor shall also provide other materials and equipment, including vacuums, filters, dropcloths, watering equipment and/or services as required to minimize the spread of dust and debris within and in the vicinity of their area of work, during the construction of the building. Such equipment and partitions shall be designed and executed to minimize noise and inconvenience to building occupants.

1.21 ACCESS

- A. Contractor will have access to the loading dock and the passenger elevator. Access to be coordinated with the Owner.

END OF SECTION

SECTION 01 73 29: CUTTING AND PATCHING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. This Section covers procedural requirements for cutting and patching, including but not limited to the following:
 - 1. Standard requirements for all cutting and patching to be done on the Project, whether by the General Contractor, Filed Sub-Contractors or other subcontractors.
- B. Refer to the following Sections for related work:
 - 1. Section 015000 - TEMPORARY FACILITIES AND CONTROLS, for temporary protection, shoring and construction aids.
 - 2. Division 02 through Division 50 Sections, for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
 - 3. Section 055000 - METAL FABRICATIONS, for furnishing of lintels where required for all penetrations through new and existing masonry.
 - 4. Section 078400 - FIRESTOPPING, for patching fire-rated construction.
 - 5. Division 09 - FINISHES, for all patching of new and existing construction, except for masonry and concrete.
 - 6. Section 092900 - GYPSUM BOARD, for cutting and patching gypsum wallboard construction.
 - 7. Section 099000 - PAINTING AND COATING, for final preparation of existing, new and patched surfaces as required for application of paint, and for paints and coatings applied to patched surfaces.
 - 8. Division 21, 22, 23 - MECHANICAL and Division 26 - ELECTRICAL, for items to be installed by mechanical and electrical trades, except as otherwise indicated.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.
- C. Coring: Any new penetration cut through existing or new construction using core drill and measuring no more than 6 inches in diameter, or 6 inches by 6 inches. Larger cores are considered under cutting.

1.4 RESPONSIBILITY FOR CUTTING AND PATCHING

- A. General: All cutting and patching shall conform to the requirements of this Section, whether or not the work is to be done by the Contractor, a Filed Subcontractor or other Subcontractor.
 - 1. Patching shall be performed so as to maintain the integrity of acoustical rating of adjacent construction.

2. Refer to Section 078410 - FIRESTOPPING, for requirements for maintaining the integrity of fire-rated construction at penetrations.
- B. Coordination: The General Contractor shall be responsible for the following:
1. Obtain locations and dimensions of penetrations required through walls and floors from trades requiring penetrations.
 2. Coordinate those penetrations with the requirements of other trades.
 3. Forward locations and dimensions of requested penetrations to the trades responsible for performing the cutting and patching work.
- C. Modifications with Structural Implications:
1. Non-masonry construction: Provide new penetrations and other work where modification to existing structural elements is shown on the Drawings.
 2. Masonry construction: Coordinate the work of Subcontractors as required where modification to existing load-bearing masonry is shown on the Drawings.
 3. Do not perform any work that will alter existing structural elements unless it is shown on the Drawings or proposed alterations have been approved in writing by the Architect.
 4. Structural elements include, but are not limited to, the following: Steel beams and columns, structural masonry walls, reinforced concrete slabs.
- D. Coring: All coring shall be performed by the trade requiring the new penetration, under the supervision of the General Contractor.
- E. New Penetrations in Masonry Construction:
1. Structural criteria for new openings in masonry walls: Bring the following conditions to the attention of the Structural Engineer for determination of whether a lintel or other reinforcement will be required.
 - a. Non-load-bearing masonry walls: Any opening wider than one block or 16 inches.
 - b. Load-bearing masonry walls: Any opening wider than 6 inches.
- F. New Penetrations in Non-Masonry Construction:
1. Exposed locations: Cutting and patching shall be provided by the trade(s) responsible for surrounding construction.
 2. Concealed locations: Cutting and patching shall be provided by the trade(s) responsible for surrounding construction.
 3. Locations at roof: Cutting and patching of roof deck and substrate shall be coordinated with the work of Section 070150 – MODIFICATIONS TO ROOFING.

1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio. Structural elements include but are not limited to the following:
1. Reinforced concrete. Coring of concrete foundation walls and slabs will be permitted where shown on drawings or required for mechanical and electrical work.
 2. Reinforced masonry bearing walls.
 3. Steel columns, beams, joists and connections.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or

decreased operational life or safety. Operating elements include but are not limited to the following:

1. Primary operational systems and equipment.
2. Air or smoke barriers.
3. Partitions and other construction required to provide acoustical separation.
4. Fire-suppression systems.
5. Mechanical systems piping and ducts.
6. Control systems.
7. Communication systems.
8. Conveying systems.
9. Electrical wiring systems.

- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

Miscellaneous elements include but are not limited to the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations. Refer to Section 015000 - TEMPORARY FACILITIES AND CONTROLS for additional requirements.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
 - 2. Cutting of openings in roofs shall be delayed as long as feasible, and preferably until the Roofing Subcontractor is at the site and can provide permanent roof covering immediately. Otherwise, protect roof openings so made in a weather tight manner until permanent roof is installed. Protect existing roofing to remain. Do not damage or alter existing roofing and flashing to remain when doing work under this Section. Refer to Section 015000– TEMPORARY FACILITIES AND CONTROLS, for additional requirements for protection from the weather.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces, in such a manner as to ensure a minimal difference between the cut area and new materials when patched.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Use extreme care when cutting through construction containing concealed mechanical and electrical lines. Coordinate cutting and patching work with the following work to be performed under Division 21, 22, 23 and 26 Sections.
 - a. Cut off pipe or conduit in walls or partitions to be removed.
 - b. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Hazardous Materials: If unanticipated hazardous materials which would be disturbed by cutting and patching are discovered at any time during the course of work, cease work in the affected area only and continue work in other areas, and notify Architect and the Owner of such discovery. Do not proceed with work in such affected areas until written instructions are received.
 - 7. Proceed with patching after construction operations requiring cutting are complete.

- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patch.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 3. Restore damaged pipe covering to its original condition.
 4. Floors and Walls: Where walls or partitions that are removed extend one finished area in- to another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 5. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 6. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

3.4 DEBRIS REMOVAL AND CLEANING

- A. Dispose of all debris in accordance with all regulations. All debris to be disposed of at a compliant disposal facility.
- B. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

SECTION 01 77 00: CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
1. Final cleaning
 2. Temporary and trial usage
 3. Coordination with Commissioning Agent
 4. Warranties and bonds
 5. Closeout requirements
 6. Inspection and Submittals for Substantial Completion
 7. Coordination with Independent Commissioning Agent
 8. Monetized Punch List Inspections
 9. Final Inspection and Submittals
 10. Final application and certificate for payment
- B. Related Work includes, but is not limited to, the following Work under other Sections:
1. Dates for Substantial Completion and Final Completion: Section 002100- INSTRUCTIONS TO BIDDERS.
 2. Procedures related to Architect's additional services if required to complete closeout of Project: Section 011400 - WORK RESTRICTIONS
 3. Construction schedule requirements: Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION.
 4. Temporary facilities to be removed at the end of the Project: Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
 5. Documents to be submitted as part of Closeout Requirements: Section 017839 - PROJECT RECORD DOCUMENTS

1.3 SUBMITTALS

- A. Warranties and Bonds: As specified herein.
1. Warranties noted as special warranties may be in excess of the standard manufacturer warranty. Contractor will be responsible to arrange for, any pay and charges related to, delivery of warranty documents that meet or exceed requirements of the contract.
- B. Punch Lists: As specified herein.
- C. Submittals for Substantial Completion: As specified herein.
- D. Final Submittals: As specified herein.

PART 2 - PRODUCTS

2.1 CLEANING MATERIALS

- A. Refer to Section 011400 - WORK RESTRICTIONS for cleaning materials.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Before final inspection, thoroughly clean the entire exterior and interior areas of the building where construction work has been performed, the immediate surrounding areas, and corridors, stairs, halls, storage areas, temporary offices, and toilets.
 - 1. Allow adequate time in Construction Schedule to perform thorough final cleaning of entire Project.
- B. Refer to Section 011400 - WORK RESTRICTIONS for general requirements for cleaning and for cleaning products, and refer to individual specification sections for cleaning requirements for particular products.
- C. Employ experienced workmen or professional cleaners for final cleaning operations.
- D. Remove all construction facilities, debris, and rubbish from the Owner's property and legally dispose of same beyond site limits.
- E. Broom clean exterior paved surfaces, and rake clean other surfaces of the grounds.
- F. Sweep, dust, wash, and polish all finished surfaces. This includes cleaning of the Work of all finished trades where needed, whether or not cleaning for such trades is included in their respective Sections.
- G. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from exposed interior and exterior surfaces.
- H. Leave pipe and duct spaces, chases, and furred spaces thoroughly clean.
- I. Wash and polish all new glass on both sides, such Work shall be performed by a contractor specializing in a window cleaning work.
- J. Clean all ceilings, wall surfaces, floors, window and door frames, hardware, metal work, glass, glazing, enameled metals, and the like.
- K. Repair, patch and touchup marred surfaces to specified finish, to match adjacent surfaces.
- L. Each Subcontractor for mechanical and electrical work, including Plumbing, HVAC, Fire Protection, and Electrical Work shall clean materials and equipment for which they are responsible, leaving the Work in a finished and clean state.
- M. For each mechanical unit that has been in operation during construction, Contractor shall clean permanent filters and replace disposable filters with new filters as specified for that mechanical unit, and shall also clean ducts, blowers and coils associated with that unit.
- N. Prior to final completion, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire Work is clean.

- O. Owner will assume responsibility for cleaning as of time designated on Certificate of Substantial Completion for Owner's acceptance of Work or portion thereof.

3.2 TEMPORARY AND TRIAL USAGE

- A. Temporary or trial usage by Owner of any mechanical device, machinery, apparatus, equipment, or any Work or materials supplied under the Contract before final completion and written acceptance by the Architect shall not be construed as evidence of acceptance as same.
- B. The Owner reserves the privilege of such temporary or trial usage for such reasonable time as required to properly test such item. Claims for damages due to injury to or breaking of any parts of such Work, when the determined cause is weakness or inaccuracy of structural parts, defective material or workmanship, will not be allowed.
- C. If the Owner so requests, place an approved person or persons to instruct and assist in such trial usage and bear the costs therefore. Trials shall be made under the Architect's supervision.

3.3 WARRANTIES AND BONDS

- A. Compile specified warranties and bonds, review to verify compliance with Contract Documents, and submit to Architect for review and subsequent transmittal, if approved, to the Owner.
- B. Assemble two original signed copies of warranties, bonds and service and maintenance contracts executed by Officers of each of the respective manufacturers, suppliers and subcontractors.
- C. Neatly type Table of Contents in orderly sequence. Provide complete information for each item:
 - 1. Product or work item identification.
 - 2. Manufacturing or supplying firm, with name of principal, address and telephone number.
 - 3. Scope of work and of warranty provided.
 - 4. Date of beginning of warranty, bond or service and maintenance contract. Commence upon date of Substantial Completion.
 - 5. Duration of warranty, bond or service maintenance contract. (In no case less than one(1) year).
 - 6. Information for Owner's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect validity of warranty or bond.
 - 7. Contractor, name of responsible principal, address and telephone number.
- D. Form of Submittals: Prepare in duplicate packets and in the following format:
 - 1. Size: 8-1/2" x 11". Punch sheets for 3-ring binder. Z-Fold larger sheets to fit into binders.
 - 2. Cover: Identify each packet with types or printed title "WARRANTIES AND BONDS". List Title of Project, Date and Name of Contractor.
 - 3. Binders: Commercial quality, three-"D"-ring, with durable and cleanable plastic covers.
- E. Time of Submittals:
 - 1. For equipment or component parts of equipment put into service during progress of construction, submit documents within ten (10) days after inspection and acceptance. Otherwise, make submittals before Date of Substantial Completion.
 - 2. For items of Work where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

- F. Submittals Required: Submit warranties, bond, service and maintenance contracts as specified in the respective Sections of the Specifications.

3.4 CLOSEOUT REQUIREMENTS

- A. Punch List: When the Contractor submits a complete list of items to be completed or corrected in accordance with subparagraph 9.8.2 of the GENERAL CONDITIONS and the Architect receives the list, the Architect will make an inspection to determine whether the Work or designated portion is substantially complete. The Contractor shall submit a schedule indicating when each item will be completed.
- B. If the Architect determines that the Contractor's list is not complete, the Architect will notify the Contractor. The Contractor shall provide a complete list before the Architect will complete his inspection.
- C. If the Architect's inspection discloses any item whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Architect will add the item to the list and will issue a punch list of items to be completed or corrected before final payment will be made. Such punch list shall not be construed as all-inclusive of the work which the Contractor will be required to perform before final payment.
- D. Substantial Completion: Architect will prepare and issue a Certificate of Substantial Completion, AIA G704, complete with signatures of Owner and Contractor, accompanied by list of items to be completed or corrected, as verified and amended by the Architect. Architect will not issue certificates of Substantial Completion until the items listed below in Articles 3.05 and 3.06 have been completed and submitted.

3.5 INSPECTION FOR SUBSTANTIAL COMPLETION

- A. In preparation for Substantial Completion, the Contractor shall submit written certification that:
 - 1. Contract Documents have been reviewed.
 - 2. Work has been inspected for compliance with Contract Documents.
 - 3. Work has been completed in accordance with Contract Documents.
 - 4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
 - 5. Work is completed, and ready for inspection.
- B. Architect will begin inspection within seven (7) days after receipt of above referenced Contractor's Certification.
- C. Should the Architect consider the Work is substantially complete in accordance with requirements of Contract Documents, the Architect will request Contractor to make Project Closeout submittals.
- D. Should the Architect consider that the Work is not substantially complete:
 - 1. The Architect will notify Contractor, in writing, stating reasons.
 - 2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to the Architect certifying that the Work is complete.

3.6 SUBMITTALS FOR SUBSTANTIAL COMPLETION

- A. Contractor shall submit the following items at Substantial Completion:
 - 1. Operating and Maintenance Data.
 - 2. Schedule for training and instruction on new mechanical and electrical systems.

3. Guarantees and Warranties.
 4. Keys and keying schedule.
 5. Spare Parts and Maintenance Materials.
 6. Roofing Guarantee and Flashing Endorsement.
 7. Evidence of Compliance with requirements of governing authorities.
 8. Punch list with schedule.
 9. Final Record Documents
 10. Rebate documentation coordinated with Owner.
- B. Evidence of compliance with authorities' requirements shall include:
1. Certificates of compliance for flame and smoke, and fire rating.
 2. Certificates of Inspection:
 - a. Mechanical
 - b. Electrical
 3. Certificate of Occupancy
- C. Submit Certificate of Insurance for products and completed operations.
- D. Instructions: Instruct Owner's personnel in the operation of all systems, mechanical, electrical and other equipment.

3.7 MONETIZED PUNCHLIST INSPECTIONS

- A. Within 30 days of Substantial Completion, the Architect will produce a Monetized Punch List that assigns a monetary value to each item remaining incomplete or incorrect.
- B. The Contractor may request two inspections by the Architect after receipt of the Monetized Punch List, for the purpose of documenting progress toward completion of items on the List.
1. If the Architect is required to inspect the Work more than twice prior to establishment of Final Completion, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform additional inspections, until the Work is considered Finally Complete.
 2. Refer to Section 011400 - WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible for costs for Additional Services of the Architect.

3.8 FINAL INSPECTION

- A. The Contractor shall complete or correct all remaining items on the Monetized Punch List in accordance with the time limits stated in the General Conditions.
- B. Certification of Final Completion: When the Contractor considers that all of the items on the monetized Punch List have been completed or corrected, the Contractor shall submit written certification that the items on the Monetized Punch List have been completed and corrected. This certification shall include a copy of the Monetized Punch List with the following information added:
1. Indicate beside each item the date when the item was completed or corrected and,
 2. In the case of items completed by subcontractors or sub-subcontractors, the name of the Subcontractor or Sub-subcontractor.
- C. The Architect will begin inspection within seven (7) days after receipt of such certification, to determine whether items on the Punch List have been completed.
1. Should the Architect determine that the Work is not complete after receipt of the certification of Final Completion, the Contractor shall be responsible to the Owner for costs for Additional Services of the Architect to perform additional inspections, until all items on the Punch List are completed.

2. Refer to Section 011400 - WORK RESTRICTIONS, for procedures required in cases where Contractor is responsible for costs for Additional Services of the Architect.

3.9 FINAL SUBMITTALS

- A. Contractor's Affidavit of Payment of Debts and Claims, AIA G706.
- B. Contractor's Affidavit of Release of Liens, AIA G706A, with:
 1. Consent of Surety to Final Payment: AIA G707.
 2. Contractor's release or waiver of liens.
 3. Separate releases or waivers of liens for subcontractors, suppliers and others with lien rights against property of Owner, together with list of those parties.
- C. All submittals shall be duly executed before delivery to the Architect.

3.10 FINAL APPLICATION AND CERTIFICATE FOR PAYMENT

- A. Contractor shall submit final application for payment in accordance with requirements of the GENERAL CONDITIONS.
- B. Architect will issue final certificate in accordance with provisions of Conditions of the Contract.
- C. Prior to issuance of the Certificate for Final Payment by the Architect, all requirements contained in this Paragraph entitled "Closeout Requirements" and other requirements of the Conditions of the Contract shall be executed, received and approved by the Architect.

END OF SECTION

SECTION 01 78 39: PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. The Work of this Section includes, but is not limited to, requirements for the following procedures:
 - 1. Record prints
 - 2. Final record drawings
 - 3. Operations and maintenance submittals and instructions.
- B. Related work includes, but is not limited to, the following work under other Sections:
 - 1. Availability and restriction for use of project electronic files: Section 011400 - WORK RESTRICTIONS.
 - 2. Availability of electronic files for preparation of record documents: Section 011400 - WORK RESTRICTIONS.
 - 3. Surveying and field engineering: Section 013100 - PROJECT MANAGEMENT AND COORDINATION.
 - 4. Photographic documentation of construction: Section 013200 - CONSTRUCTION PROGRESS DOCUMENTATION.
 - 5. General requirements for submittals: Section 013300 - SUBMITTAL PROCEDURES.
 - 6. Other submittals required at the completion of the Work: Section 017700 - CLOSEOUT PROCEDURES.

1.3 DEFINITIONS

- A. Record Prints are full sets of black-line or blue-line prints of Contract Drawings, kept at the Project Site and marked regularly to record as-built conditions as specified herein.
- B. Final Record Drawings: Reproducible drawings or electronic files prepared from completed and approved Record Prints.
- C. Final Record Coordination Drawings: Reproducible drawings or electronic files prepared from updated prints of approved coordination drawings, to record as-built conditions.

1.4 SUBMITTALS

- A. Final Record Drawings: Reproducible drawings, as specified in this Section:
 - 1. Final Record Drawings
 - 2. Final Record Coordination Drawings
- B. Operations and Maintenance Submittals:
 - 1. Maintenance Manuals
 - 2. Schedule of Training and Instruction for mechanical and electrical systems.

PART 2 - PRODUCTS

2.1 RECORD DOCUMENTS, GENERAL

- A. The General Contractor shall maintain Record Prints of site plans, landscape drawings, architectural drawings, and structural drawings.
- B. Filed Sub-Contractors shall maintain Record Prints of the Work of the following Sections:
 - 1. Division 21 - FIRE PROTECTION.
 - 2. Division 22 - PLUMBING.
 - 3. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING.
 - 4. Division 26 - ELECTRICAL.

2.2 RECORD PRINTS

- A. During the progress of the Work, the General Contractor shall keep on file at all times two (2) complete and separate sets of black line prints of the entire set of Contract Drawings. Each set shall be updated daily to record the following information:
 - 1. Status of Work: One set shall be used to indicate the progress of the Work installed by coloring in the various pipelines, ducts, and apparatus as erected.
 - 2. Revisions: The second set shall be accurately and promptly updated with colored inks, daily as the Work progresses, to accurately record all revisions to the Work, including, but not limited to, the following:
 - a. Fire Protection, Plumbing, Heating and Ventilating, and Electrical Work, wherever Work was installed other than as shown on the Contract Drawings or described in the Specifications
 - b. Locations, elevations, sizes, etc. of all concealed and buried utilities, ducts, and services, including exterior utility and storm drainage lines.
 - c. The General Contractor shall be responsible for assuring that the various revisions are delineated by the specific trades involved.
 - 3. Both sets shall be kept available at all times for use and inspection by the Architect and the Owner.
- B. Refer to Section 011400 Work Restrictions for Project Electronic Files to be made available for use by the Contractor in the preparation of Final Record Drawings.
- C. Transfer all information from the updated Record Prints to the electronic files at least once every three months.
 - 1. Submit three prints of each updated drawing to the Architect at least three times during construction: when the work is approximately 1/4, 1/2, and 3/4 complete.
 - 2. When roughing in for any particular area is completed, it shall be shown on the Record Prints and a copy submitted for Architect's review.

2.3 FINAL RECORD DRAWINGS

- A. Before completion of the Work, and when directed by the Architect, the General Contractor and all indicated subcontractors shall perform the following:
 - 1. Transcribe all previously recorded information from Record Prints onto the electronic files.
 - 2. Make all final changes and corrections to the electronic files for the Final Record Drawings.
 - 3. Signatures Required: The General Contractor or Filed Sub-Contractor shall sign each drawing for which they are responsible, as certification that the work was installed as shown.
 - 4. Deliver signed, completed Final Record Drawings to Architect.

- B. Acceptance by the Architect of the completed Final Record Drawings shall be a prerequisite for Substantial Completion.
- C. Shop Drawings will not be acceptable as Final Record Drawings for the Project.
- D. The Architect shall be the sole judge of the acceptability of Final Record Drawings.
- E. Special Requirements for Final Record Drawings of Site Work:
 - 1. Record Drawings for exterior utilities and other items below grade shall include accurate locations of the following:
 - a. The points where such items enter the building and property lines.
 - b. All turns, offsets, and other changes in direction below grade.
 - c. All valves and other appurtenances.
 - 2. Indicate locations of these items using dimensions to adjacent permanent benchmarks or structures as approved by the Architect. Reliance on scale only to locate any temporary or concealed construction will not be acceptable.
 - 3. Final Record Drawings for work below grade shall be submitted immediately upon completion of utility line installation and prior to concealment of the work
 - 4. Refer to Division 2 Sections for additional requirements for Final Record Drawings of site work.

2.4 MAINTENANCE MANUALS

- A. Upon Substantial Completion of the Work, submit maintenance schedules, maintenance manuals, and all approved Shop Drawings, presenting full details for care and maintenance of visible surfaces and all equipment furnished and installed under the Contract.
- B. Maintenance manuals shall consist of manufacturer's catalog cuts with descriptive information, lubricating and maintenance instructions, parts lists, usage instructions, names, addresses and telephone numbers where replacement parts and service can be quickly obtained, and all other information required for the Owner to use, maintain, and service the items properly.
- C. Upon Architect's approval of drafts, submit two (2) corrected copies properly bound in a logical and well arranged order, with index, to the Architect for transmittal to the Owner.

PART 3 - EXECUTION

3.1 TRAINING AND INSTRUCTIONS

- A. The Contractor shall arrange for instruction for the Owner's employees, to insure proper operation of the equipment furnished.
 - 1. It is the intent of this paragraph to require the Contractor and the applicable Subcontractors to furnish as much detailed instruction as is necessary to educate the Owner's on-site personnel in the proper use of the equipment.
 - 2. This instruction shall be provided by a qualified trainer who is also a manufacturer's certified technician with expertise with the specific system or equipment for which training is required. In some cases, this may require more than one visit to the Project by those responsible for the instruction.
 - 3. The Contractor and, in particular, the Plumbing, Heating and Ventilating, and Electrical Subcontractors shall not assume that the Owner's employees possess special expertise or have had any previous experience whatsoever in the operation and maintenance of sophisticated mechanical and electrical equipment.

4. Submit the schedule for instructional sessions to the Owner. Do not proceed with instruction until Owner has approved schedule.
 5. Refer to specific technical sections for additional requirements specific to particular equipment and systems.
- B. For major items of mechanical and electrical equipment, instructions and demonstrations shall be performed during the initial start-up period and, if necessary, during one or more return visits as may be required.
- C. Videotape: Instruction sessions and demonstrations shall be videotape-recorded by professional videographers in digital format on DVD format, using tripods, broadcast-quality video cameras and proper lighting. Close-ups of items being demonstrated shall be included. Sound recording shall be clear and perfectly intelligible. DVDs shall be edited as required to provide a permanent reference. Each session and demonstration shall be included, except where waived by the Architect, and all DVDs shall be properly labeled as to date, subject, and presenter. Provide two (2) copies of each DVD.

END OF SECTION

SECTION 02 41 00: DEMOLITION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included:
1. Demolition of selected building elements; see drawings for limits of demolition.
 3. Salvage of existing items to be reused or turned over to the facility.
 4. Removal and legal disposal of demolished materials off site. Except those items specifically designated to be relocated, reused, or turned over to the facility, all existing removed materials, items, trash and debris shall become property of the Contractor and shall be completely removed from the site and legally disposed of at her/his expense. Salvage value belongs to the Contractor. On-site sale of materials is not permitted.
 5. Due to asbestos-containing materials being encapsulated, rather than completely abated, it is the intent of the Documents that demolition of materials directly adjacent to asbestos-containing materials shall occur under full containment.
- B. Alternates: Alternate1 and Alternate 2.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
1. Section 015000 - TEMPORARY FACILITIES AND CONTROLS:
 - a. Maintenance of access, cleaning during construction, dust and noise control.
 2. Section 028000 - ASBESTOS ABATEMENT
 3. Section 028010 – DISTURBANCE OF LEAD, CADMIUM, AND CHROMIUM MATERIALS.
 4. Section 020820 – MISCELLANEOUS HAZARDOUS MATERIALS REMOVAL.
 5. Division 21 - FIRE PROTECTION:
 - a. Disconnecting, capping and otherwise making inactive existing mechanical services in areas where demolition and removal work is required. Mechanical tradesmen will disconnect, cap, inactivate and lower to floor such items were required to be removed under Division 21 - FIRE PROTECTION. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
 - b. Disconnect and reinstallation of fire protection equipment temporarily interrupted during construction.
 6. Division 22 - PLUMBING:
 - a. Disconnecting, capping and otherwise making inactive existing mechanical services in areas where demolition and removal work is required. Mechanical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Division 23 - PLUMBING. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
 - b. Disconnect and reinstallation of plumbing equipment temporarily interrupted during

construction.

7. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING:

- a. Disconnecting, capping and otherwise making inactive existing mechanical services in areas where demolition and removal work is required. Mechanical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Division 23 - HEATING, VENTILATING AND AIR CONDITIONING. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
- b. Disconnect and reinstallation of HVAC equipment temporarily interrupted during construction.

8. Division 26 - ELECTRICAL:

- a. Disconnecting, capping and otherwise making inactive existing electrical services in areas where demolition and removal work is required. Electrical tradesmen will disconnect, cap, inactivate and lower to floor such items where required to be removed under Division 26 - ELECTRICAL. Removal and storage of such materials shall be then done under this Section 024100 - DEMOLITION.
- b. Disconnect and reinstallation of electrical equipment temporarily interrupted during construction.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to the Owner ready for reuse, at a location designated by the Owner. Protect from weather until accepted by Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated. Protect from weather until reinstallation.

1.4 MATERIALS OWNERSHIP

- A. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain property of the Owner as applicable. Carefully remove each item or object in a manner to prevent damage and deliver promptly to a location acceptable to the Owner.

1.5 SUBMITTALS

- A. Landfill Records: Provide trip tickets (receipts) indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.6 QUALITY ASSURANCE

- A. Examination of Existing Conditions: The Contractor shall examine the Contract Drawings for demolition and removal requirements and provisions for new work. Verify all existing conditions and dimensions before commencing work. The Contractor shall visit the site and examine the existing conditions as he finds them and shall inform herself/himself of the character, extent and type of demolition and removal work to be performed. Submit any questions regarding the extent and character of the demolition and removal work in the manner and within the time period established for receipt of such questions during the bidding period.

- B. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- C. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
- D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- E. Standards: Comply with ANSI A10.6 and NFPA 241.

1.7 PROJECT CONDITIONS

- A. Spaces immediately adjacent to demolition area will be occupied. Conduct building demolition so neighboring operations of occupied buildings will not be disrupted.
 - 1. Maintain access to existing corridors, exits, and other facilities used by occupants of adjacent spaces.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent spaces without written permission from authorities having jurisdiction.
- B. Owner assumes no responsibility for elements and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 SALVAGING

- A. Salvaged for Reinstallation: Materials indicated on the Drawings or designated in the field by the Owner to be salvaged and reinstalled shall be carefully removed and stored at a location acceptable to the Architect and Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped in area of demolition.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with Owner.
2. Cut off pipe or conduit in walls or partitions to be removed. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.
3. Prior to commencing cutting work in existing surfaces, take all precautionary measures to assure that mechanical and electrical services to the particular area have been made inactive. Coordinate with Fire Protection, Plumbing, HVAC, and Electrical subcontractors. Only licensed tradesmen of that particular trade shall disconnect mechanical and electrical.
4. If, during the process of cutting work, existing utility lines are encountered which are not indicated on the Drawings, regardless of their condition, immediately report such items to the Architect. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Comply with requirements for access and protection specified in Section 015000 - TEMPORARY FACILITIES AND CONTROLS.
- B. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Remove temporary shoring, bracing and structural supports when no longer required.
 2. Post warning signs and place barricades as applicable during placement and removal of temporary shoring.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area(s).
 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction. Provide temporary barricades as required to limit access to demolition areas.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
- D. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction scheduled to be salvaged or re-used.
 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.

6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

3.5 PROTECTION OF PUBLIC AND PROPERTY

- A. Provide all measures required by federal, state and municipal laws, regulations, and ordinances for the protection of surrounding property, the public, workmen, and Owner's employees during all demolition and removal operations. Measures are to be taken, but not limited to installation of sidewalks, sheds, barricades, fences, warning lights and signs, trash chutes and temporary lighting.
- B. Protect all walks, roads, streets, curbs, pavements, trees and plantings, on and off premises, and bear all costs for correcting such damage as directed by the Architect, and to the satisfaction of the Owner.
- C. Demolition shall be performed in such a manner that will insure the safety of adjacent spaces and property. Protect adjacent spaces and property from damage and protect persons occupying adjacent spaces from injuries which might occur from falling debris or other cause and so as not to cause interference with the use of other portions of the building, of adjacent buildings or the free access and safe passage to and from the same.
- D. Remove portions of structures with care by using tools and methods that will not transfer heavy shocks to existing and adjacent building structures, both internal and external of the particular work area.
- E. Provide and maintain in proper condition, suitable fire resistive dust barriers around areas where interior demolition and removal work is in progress. Dust barriers shall prevent the dust migration to adjacent areas. Remove dust barriers upon completion of major demolition and removal in the particular work area.

3.6 DISCOVERY OF HAZARDOUS MATERIALS

- A. If hazardous materials, such as chemicals, asbestos-containing materials, or other hazardous materials are discovered during the course of the work, cease work in affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Continue work in other areas.
- B. If unmarked containers are discovered during the course of the work, cease work in the affected area only and immediately notify the Architect and the Owner of such discovery. Do not proceed with work in such areas until instructions are issued by the Architect. Take immediate precautions to prohibit endangering the containers integrity. Continue work in other areas.

3.7 CUTTING

- A. Perform all cutting of existing surfaces in a manner which will ensure a minimal difference between the cut area and new materials when patched. Use extreme care when cutting existing surfaces containing concealed utility lines which are indicated to remain and bear full responsibility for repairing or replacement of all such utilities that are accidentally damaged.
- B. Provide a flush saw cut edge where pavement, curb and concrete removals abut new construction work or existing surfaces to remain undisturbed.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. General:
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Debris to be properly transported to a disposal facility licensed to accept construction debris.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Premises shall be left in a clean condition and ready to accept alteration work and new construction.

END OF SECTION

SECTION 02 82 13
ASBESTOS ABATEMENT

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Related Information:
 - 1. Division 02 – Selective Demolition
 - 2. Drawing AD1.1 identifying proposed extent of demolition and asbestos abatement work as prepared by Turowski2 Architecture, Inc. and Fuss & O'Neill EnviroScience, LLC, dated March 6, 2013.
 - 3. Limited Hazardous Building Materials Inspection report prepared by Fuss & O'Neill EnviroScience, LLC, dated February 1, 2013.

1.02 SCOPE OF WORK

- A. The scope of abatement work is work necessary to facilitate 6th Floor Office Renovation at Arlington High School.
- B. Work shall be performed by a licensed Asbestos Abatement Contractor with certified Asbestos Workers and Supervisor(s) (the "Asbestos Abatement Subcontractor"). Training shall be in accordance with Massachusetts Department of Labor Standards (DLS), formerly known as the Division of Occupational Safety (DOS), Regulation 453 CMR 6.00.
- C. The Owner shall retain the services of a consulting firm of their choosing who will be responsible for conducting project monitoring, final visual inspection, and final air clearance sampling. Clearance samples shall be conducted using Phase Contrast Microscopy (PCM).
- D. This section of the Specifications addresses hazards relating to the removal of asbestos-containing materials.
- E. Interior removal of existing vinyl asbestos floor tile, relating to carpet removal and removal/installation of interior wall systems, shall be performed in full containment as established herein.
- F. Interior spot removal of existing asbestos-containing flooring layers to facilitate core drilling on all floors shall occur within mini-enclosure containments as established herein.
- G. Exterior demolition of existing air-handling unit sealant, roofing, and curbing shall be performed as established herein.
- H. It should be noted that significant coordination is required for all abatement work to ensure all scheduling and sequencing is properly coordinated.
- I. Removal of Category I non-friable roofing materials is not regulated by the Commonwealth of Massachusetts regulation 453CMR 6.00 as long as the methods of removal consist of breaking shearing or slicing, where such work does not produce asbestos dust or result in materials becoming friable. Any other methods such as grinding, cutting (by sawing), chipping, or abrading, or result in asbestos dust or materials becoming friable, shall be performed in accordance with the above regulations.

- J. The following table summarize the locations of work with estimated material quantities, detailed locations of work are shown on demolition drawings prepared by others as referenced in 1.01 (B)(2).

LOCATION	MATERIAL TYPE	ESTIMATED QUANTITY
Roof	The hazardous materials abatement contractor shall remove and dispose of all Black Sealant on Air Handling Unit	100 LF
Roof	The hazardous materials abatement contractor shall remove and dispose of all Roofing Layers and Curbing Associated with HVAC Unit (Assumed Positive)	250 SF
6 th Floor	The hazardous materials abatement contractor shall remove and dispose of all loose/damaged vinyl asbestos floor tile resulting from carpet removal (within full containment) in order to establish sound base for new carpet.	Base Bid Quantity = 500 SF
6 th Floor	The hazardous materials abatement contractor shall remove and dispose of all loose/damaged vinyl asbestos floor tile resulting from wall removal (within full containment) to establish sound base for new carpet. Intent of wall removal is to avoid disturbance to underlying floor tile (e.g. cutting fasteners, etc.)	Base Bid Quantity = 225 SF
6 th Floor	The hazardous materials abatement contractor shall remove and dispose of top layer vinyl asbestos floor tile only leaving mastic adhesive (within full containment) to existing underlayment to accommodate new walls.	Base Bid Quantity = 575 SF
Basement through 6 th Floor	The hazardous materials abatement contractor shall remove and dispose of 4 SF of all flooring layers (to existing subfloor) to facilitate core drilling on all floors. Removal shall occur within (6) mini-enclosure containments where noted for new electrical conduit extending from 6th floor to basement.	Base Bid Quantity for Electrical Risers = 6 Mini-Enclosure Containments @ 4 SF EA

SF = Square Feet, LF = Linear Feet

1.03 DEFINITIONS

- A. General: Applicable provisions of the General Conditions and Supplementary Conditions of the Contract and General Requirements are given in this section. For the purposes of this section, the following definitions apply:
1. Abatement - Procedures to control fiber release from asbestos-containing materials; includes removal, encapsulation, and enclosure.
 2. Air Monitoring - The process of measuring the fiber concentration of an area or the breathing zone of a person.
 3. Amended Water - Water to which a surfactant has been added.
 4. Asbestos - The name given to a number of naturally occurring fibrous silicates. This includes the serpentine forms and the amphiboles and includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite, or any of these forms which have been chemically altered.
 5. Asbestos Work Area - A regulated area as defined by OSHA 29 CFR 1926.1101 where asbestos abatement operations are performed which is isolated by physical boundaries to prevent the spread of asbestos dust, fibers, or debris. The regulated area shall comply with requirements of regulated area for demarcation, access, respirators, prohibited activities, competent persons and exposure assessments and monitoring.
 6. Asbestos Fibers - Particles with a length greater than five (5) microns and a length to diameter ratio of 3:1 or greater.
 7. Cease and Desist Order - An order issued by the Department of Labor and Industries Commissioner closing a work site where the Commissioner determines that violations of a workplace standard relative to the protection of the occupational health and safety of workers or of any standard or requirement of licensure exist.
 8. Clean Room - An uncontaminated area or room which is a part of the worker decontamination enclosure with provisions for storage of workers' street clothes and protective equipment.
 9. Commissioner - The Commissioner of the Department of Labor and Work Force Development or his/her designee.
 10. Competent Person - As defined by 29 CFR 1926.1101, a representative of the Abatement Contractor who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure and has authority to take prompt corrective measures to eliminate such hazards during asbestos removal. Competent person shall be properly trained in accordance with EPA's Model Accreditation Plan.
 11. Consultant - A company retained by the Owner with a Massachusetts licensed asbestos designer and project monitors to provide services enumerated in this section during asbestos abatement.
 12. Asbestos Abatement Subcontractor - Any person, firm, corporation, or other entity who has a valid license issued by the Commonwealth of Massachusetts for the purpose of entering into or engaging in asbestos abatement work.
 13. Class I Asbestos Work - means activities involving the removal of thermal system insulation (TSI) and surfacing asbestos containing materials (ACM) and presumed ACM (PACM).
 14. Class II Asbestos Work - means activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos containing wallboard, floor tile and sheeting roofing and siding shingles, and construction mastics.
 15. Curtained Doorway - A device to allow ingress and egress from one area to another while permitting minimal air movement between the areas. Two curtained doorways spaced a minimum of six feet apart from an airlock.
 16. Decontamination Enclosure System - A series of connected areas, with curtained doorways between any two adjacent areas, for the decontamination of workers and equipment. A decontamination enclosure system contains at least one airlock and is adjacent and connected to the regulated area, where feasible.
 17. DLS - The Massachusetts Department of Labor Standards formerly known as the Division of Occupational Safety (DOS).

18. Encapsulant - A liquid material which can be applied to asbestos-containing materials which controls the possible release of asbestos fibers from the materials either by creating a membrane over the surface (bridging encapsulant) or penetrating the material and binding its components together (penetrating encapsulant).
19. Equipment Room -A contaminated area or a room which is part of the worker decontamination enclosure with provisions for storage of contaminated clothing and equipment.
20. Fixed Object- A unit of equipment or furniture in the work areas which cannot be removed from the work area.
21. Friable Asbestos Material -Any material that contains more than 1% asbestos as determined by Polarized Light Microscopy (PLM), that can be crumbled, pulverized or reduced to powder by hand pressure.
22. HEPA Filter- A high efficiency particulate air (HEPA) filter in compliance with ANSI Z9.2-1979.
23. HEPA Vacuum Equipment- Vacuum equipment with a HEPA filter system for filtering the effluent air from the unit.
24. License - A document issued by the DLS authorizing an asbestos abatement to engage in the business of asbestos abatement projects.
25. Movable Object - A unit of equipment or furniture in the work area which can be removed from the work area.
26. NESHAPS - National Emissions Standard for Hazardous Air Pollutants, regulations enforced by the EPA.
27. Permissible Exposure Level (PEL) -The maximum airborne concentration of asbestos fibers to which an employee is allowed to be exposed. The new level established by OSHA 29 CFR 1926.1101 is 0.1 fibers per cubic centimeter of air as an eight (8) hour time weighted average and 1.0 fibers/cc averaged over a sampling period of 20 minutes as an excursion limit. The Asbestos Abatement Subcontractor is responsible for maintaining work areas in a manner that this standard is not exceeded.
28. Project Monitor - A professional capable of conducting air monitoring and analysis schemes. This individual should be an industrial hygienist, an environmental scientist or an engineer with experience in asbestos air monitoring and worker protection equipment and procedures. This individual should have demonstrated proficiency in collection of air samples in accordance with 29 CFR 1910.1001 and 1926.1101. The project monitor shall be licensed in the Commonwealth of Massachusetts and possess appropriate training certificates including current refresher training for project monitor.
29. Regulated Area - An area established by the employer (Asbestos Abatement Subcontractor) to demarcate where Class I, II, and III asbestos work is conducted and any adjoining area where debris and waste from such asbestos work accumulate, and a work area within which airborne concentrations of asbestos exceed or there is a reasonable possibility that they may exceed the PEL.
30. Shower Room -A room between the clean room and the equipment room in the worker decontamination enclosure with hot and cold running water and suitably arranged for employee showering during decontamination.
31. Surfactant - A chemical wetting agent added to water to improve penetration into asbestos-containing materials.
32. Visible Debris - Any visually detectable particulate residue such as dust, dirt, or other matter which may or may not contain asbestos
33. Waterproofing - material, usually a membrane or applied compound (tar/mastic), used to make a surface impervious to water, includes concealed conditions (applications around doors, windows, and in wall cavities.) Sometimes combined with felts.

1.04 APPLICABLE DOCUMENTS/REFERENCES

- A. Safety Regulations. The following regulations deal with job site safety pertaining to asbestos abatement and general construction. All regulations shall be strictly adhered to.

- B. Occupational Safety and Health Administration
 - 1. 29 CFR 1910.1001 General Industry Standards
 - 2. 29 CFR 1910.134 Respiratory Protection
 - 3. 29 CFR 1910.1200 Hazard Communication
 - 4. 29 CFR 1910.245 Specifications for Accident Prevention (Sign & Tags)
 - 5. 29 CFR 1926 Construction Industry Standard
 - 6. 29 CFR 1926.1101 Asbestos Construction Standard

- C. Codes and Standards. All work shall conform to the standards set by applicable federal, state, and local laws, regulations, ordinances, and guidelines in such form in which they exist at the time of the work on the Contract and as may be required by subsequent regulations including the following:
 - 1. ASTM - American Society for Testing Materials
 - 2. ANSI - American National Standards Institute
 - a) ANSI Z228.2-8 Practices for Respiratory Protection
 - b) ANSI Z9.2 1979 Fundamentals Governing the Design and Operation of Local Exhaust Systems.

- D. Asbestos Regulations. In addition to any detailed requirements of the Specifications, the Asbestos Abatement Subcontractor shall, at his own cost and expense, comply with all laws, ordinances, rules and regulations of federal, state, regional and local authorities regarding handling and storing of asbestos waste material.
 - 1. Massachusetts DEP Regulations 310 CMR
 - a) 7.00- Air Pollution Control
 - b) 7.09 U- Dust, Construction and Demolition
 - c) 7.15 U- Asbestos
 - d) 9.00 - Solid Waste Management Regulations
 - e) Massachusetts DLS 453 CMR 6.00 The Removal, Containment or encapsulation of Asbestos.
 - f) USEPA NESHAPS Regulation (40 CMR 61, Subpart M)
 - g) USEPA - AHERA Regulation (40 CFR 763, Sub-part E)
 - h) 310 CMR 18 & 19

1.05 NOTIFICATIONS/PERMITS

- A. Regulatory Agency Notifications. The Asbestos Abatement Subcontractor shall make the following notifications, and provide the submittals to the following agencies within the allotted number of days designated below:
 - 1. At least ten (10) working days prior to the commencement of any abatement activity.
Commonwealth of Massachusetts Department of Environmental Protection Asbestos Program
P.O Box 120087
Boston, MA 02112
File ANF-001 Form which constitutes notification to both MassDEP and DLS.

- B. Minimum Requirements. The notifications to the above auspices shall, at a minimum, include the following information:
 - 1. Name, address and telephone number of the facility owner.
 - 2. Name, address and telephone number of the entity or person performing the project.
 - 3. Massachusetts Asbestos Contractor License Number.
 - 4. Name and certification number of current job supervisor.
 - 5. Nature of the project (demolition-renovation-other).
 - 6. Asbestos abatement activity (removal-enclosure-encapsulation).
 - 7. Address and location of the work.
 - 8. Description of the facility (type of building-size-age).
 - 9. Use of the facility.

10. Amount of friable asbestos material to be removed-enclosed-encapsulated.
 11. Start and completion dates.
 12. Description of work practices to be followed to comply with 453 CMR 6.14.
 13. Description of disposal methods to be employed to comply with 453 CMR 6.14(2)(g).
 14. Name and address/location of the disposal site to be used.
- C. Fees, Permits and Licenses. The Asbestos Abatement Subcontractor shall pay all licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or processing in the performance of the work specified in this Section.
1. The Asbestos Abatement Subcontractor shall be solely responsible for costs, damages, or losses resulting from any infringement of these patent rights or copyrights. The Asbestos Abatement Subcontractor shall hold the Owner, Architect and the Consultant harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights.
 2. The Asbestos Abatement Sub-Contractor shall be responsible for securing all necessary permits for work under this Section, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.

1.06 COORDINATION/COOPERATION

- A. Pre-Construction Meeting. The Asbestos Abatement Subcontractor shall meet with the Owner, Architect the Consultant and General Contractor for a Pre-Construction meeting prior to commencing work on the project. The meeting shall be at the facility of the Owner at a mutually convenient time and date to be determined by the Owner. At the meeting, the Asbestos Abatement Sub- Contractor shall be represented by authorized representatives and the foreperson that shall run the project on a daily basis, and shall present evidence that requirements for initiation of the work have been met. The minimum agenda for the meeting shall be:
1. Channels of communication;
 2. Construction schedule, including sequence of critical work;
 3. Designation of responsible personnel;
 4. Procedures for safety, security, quality control, housekeeping, and related matters;
 5. Use of premises, facilities and utilities;
 6. Review of "Pre-Job Submittals;" and
 7. Discussion of a detailed Project Specification Work Plan composed of at least the following:
 - a) A sketch showing the detail, location and layout of the clean area, the dirty area {decontamination System) and the work area
 - b) The sequencing of the work.
 - c) The timing and projected completion of the work.
 - d) Detailed description of the methods to be employed in order to control airborne and waste water pollution.
 - e) The procedures to contain, package and remove the waste from the work area and the procedures and locations of the disposal of hazardous and non-hazardous waste.
 - f) An air sampling plan for worker protection including air sampling training and strategy, sampling locations, projected number of samples; and frequency, methodology, and duration of sampling.
 - g) The type of respirators to be used, protective equipment to be used, and a respirator program, if applicable.
 - h) A safety precaution plan including special precautions taken by the Asbestos Abatement Subcontractor in performing tasks, safety equipment to be worn by employees, frequency of safety meetings, and other relevant functions to be performed by the Asbestos Abatement Subcontractors to ensure a safe workplace.
 - i) An asbestos waste storage and disposal plan which describes the methods the Asbestos Abatement Subcontractor shall employ to safely transfer, handle, and store asbestos waste prior to removal from the site. Note, Owner has requested that no asbestos waste or asbestos waste storage trailers be located on site. Asbestos waste must be removed

from site on a daily basis.

- B. Lab Testing and Inspections. The performance and execution of the project shall be monitored by the Consultant to ensure full compliance with these Specifications and applicable regulations. The Owner shall assume the cost associated with independent laboratory and inspection work required in this Specification for the final inspections and random analyses as specifically noted.
- C. Consultant's Authority. The Owner shall retain an industrial hygiene firm for the purposes of the management of the Asbestos Abatement described herein. The Consultant shall represent the Owner in all phases of the asbestos abatement project at the discretion of the Owner. The Asbestos Abatement Subcontractor shall regard the Consultant's on-site Inspector's direction as authoritative and binding as provided herein, in matters particularly, but not limited to, the following:
 - 1. Approval of work areas.
 - 2. Review of monitoring results.
 - 3. Completion of the various segments of work.
 - 4. Final clearance of asbestos abatement.
 - 5. Submission of data.
 - 6. Daily field punch-list items.

1.07 DOCUMENTATION/SUBMITTALS

- A. Pre-Abatement. The Asbestos Abatement Subcontractor shall provide the following Pre-Abatement Submittals prior to the Pre-Construction Conference for the acceptance of the Consultant. Upon acceptance pre-construction meeting will be scheduled. See Division 1 section 00 70 00 for submittal requirements.
 - 1. Copies of all notifications, permits, applications, licenses and like documents required by federal, state, or local regulations obtained or submitted in proper fashion.
 - 2. Copies of medical records for each employee to be used on the project and a notarized statement by the examining medical doctor that such examinations took place and when.
 - 3. Copies of Asbestos Abatement Subcontractor's certificates, licenses, and copies of each supervisor's license and workers' certificates.
 - 4. Record of successful respirator fit testing performed by a qualified individual within the previous year, for each employee to be used on this project with the employee's name and social security number with each record.
 - 5. Proposed respiratory protection program for employees throughout all phases of the project, including make, model and NIOSH approval numbers of respirators to be used.
 - 6. A detailed Project Specification Work Plan.
 - 7. Written description, for the Consultant's review and acceptance, of all proposed procedures, methods, or equipment to be utilized that differ from the Contract Specifications, including manufacturers specifications on any equipment not specified for use by this Section; in all instances, the Asbestos Abatement Subcontractor must comply with all applicable federal, state and local regulations.
 - 8. Proposed electrical safeguards to be implemented by a qualified Electrical Subcontractor, including but not limited to location of transformers, GFCI outlets, lighting, and power panels necessary to safely perform the project, including a description of electrical hazards and a safety plan for common practices in the work area.
 - 9. Proposed worker orientation plan that at a minimum includes a description of asbestos hazards and abatement methodologies, a review of worker protection requirements, and the outline of safety procedures.
 - 10. Chain-of-Command for responsibility at the work site including supervisors, foreman, and competent person, their names, resumes and certificates of training.
 - 11. List of all supervisors and workers intended to be assigned to the project.

12. Proposed Emergency Plan and route of egress from work areas in case of fire or injury, including the name and phone number of nearest medical assistance center. This shall be conspicuously posted at the work site.
13. The name and address of the Asbestos Abatement Subcontractor's personal air monitoring testing laboratory including certification(s) of AIHA accreditation and presentation of a documented Quality Assurance and Quality Control Program.
14. Material Safety Data Sheets (MSDS) on all materials and chemicals to be used on the project.
15. Name, address, and ID number of the asbestos waste hauler, waste transfer route, and proposed disposal site.
16. Name, address, and ID number of the proposed construction debris site.

1.08 PERSONNEL PROTECTION

- A. General. Prior to commencing work, all workers shall be instructed in aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.
- B. Asbestos Abatement Subcontractor Responsibilities. At a minimum, the Asbestos Abatement Subcontractor shall be responsible for ensuring that the following procedures are adhered to:
 1. Asbestos Abatement Subcontractor shall provide appropriate respiratory protection equipment for each worker and ensure usage during potential asbestos exposure during Class I and II abatement work.
 2. Asbestos Abatement Subcontractor shall select respirators from among those jointly approved as being acceptable for protection by the Mine Safety and Health Administration (MSHA) and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part 11.
 3. Asbestos Abatement Subcontractor shall have adequate supply of filter elements and spare parts on site.
 4. Asbestos Abatement Subcontractor shall provide and require all workers to wear protective clothing in work areas where asbestos fiber concentrations exceed or may exceed permissible exposure limits established by OSHA and in conformance with protection required for Class I and II abatement work. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot covering.
 5. Asbestos Abatement Subcontractor shall provide all authorized persons entering contaminated areas with proper respirator and set of protective clothing.
 6. All workers and authorized persons shall use worker decontamination at each time exiting or entering the work area including each work shift.
 7. Exit procedures require HEPA vacuuming of gross contamination from protective clothing before leaving work area, proceed to equipment room for removal of protective clothing except respirator, wearing only respirator proceed to shower, after thorough washing including respirator, proceed to clean room for dressing in street clothes.
 8. Entry and exit procedures are followed for entry into and exit from contaminated areas.
 9. All contaminated protective clothing shall be disposed of as contaminated waste.
 10. Workers shall not eat, drink, smoke, or chew gum or tobacco while in work area.
 11. Workers shall be fully protected with respirators and protective clothing immediately prior to the first disturbance of asbestos containing or contaminated materials and until final cleanup is completed.
- C. Minimum Respiratory Requirements. The Asbestos Abatement Subcontractor is solely responsible for ensuring that the following minimum respiratory protection requirements are met throughout the project:

Respiratory protection shall meet the requirements of OSHA as presented in 29 CFR 1910.134 titled "Respiratory Protection" and 29 CFR 1926.1101

"Construction Standards." The following table 1 has been obtained from 1910.134(d)(3)(i)(A) and incorporated as follows:

Assigned Protection Factors (APFs) Employers must use the assigned protection factors listed in Table 1 to select a respirator that meets or exceeds the required level of employee protection. When using a combination respirator (e.g., airline respirators with an air-purifying filter), employers must ensure that the assigned protection factor is appropriate to the mode of operation in which the respirator is being used.

Table 1. -- Assigned Protection Factors⁵

Type of respirator ^{1, 2}	Quarter mask	Half mask	Full face-	Helmet/hood	Loose-fitting
1. Air-Purifying Respirator	5	³ 10	50
2. Powered Air-Purifying Respirator	50	1,00	⁴ 25/1,00	25
3. Supplied-Air Respirator (SAR) or Airline Respirator	10	50
• Demand mode	50	1,000	.	25
• Continuous flow mode	50	1,000	⁴ 25/1,00
• Pressure-demand or other positive- pressure mode	0
4. Self-Contained Breathing Apparatus (SCBA)	10	50	50
• Demand mode	10,000	10,000
• Pressure-demand or other positive- pressure mode (e.g., open/closed circuit)

Notes:

- Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.
- The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.
- This APF category includes filtering face-pieces, and half masks with elastomeric face-pieces.
- The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting face-piece respirators, and receive an APF of 25.
- These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance- specific standards in that subpart. Escape respirators for other IDLH atmospheres are specified by 29 CFR 1910.134 (d)(2)(ii).

- D. Asbestos Abatement Subcontractor shall also determine if additional worker protection or respiratory protection requirements are necessary to permit access to confined space in order to complete required asbestos removal work.

1.09 SEQUENCING AND SCHEDULING

- A. Work/Scheduling Requirements. Work shall be carried out in sequential phases. Inspection and approval of each phase by the Consultant's shall be sought and gained before proceeding to the next phase and in accordance with the schedule. The Asbestos Abatement Subcontractor shall comply with Phasing Plan identified herein and coordinate all work with other sub- trades. Multiple mobilizations will be required and all requirements to ensure continued use of the facility shall be adhered to and at no additional cost to the Owner.
- B. Work Sequences. Work sequences within the scope of the asbestos containing materials abatement must be performed sequentially to maintain continuity. The following conditions apply to specific job sequencing:
 - 1. At no time shall the Asbestos Abatement Sub- Contractor cause or allow to be caused conditions that may cause risk or hazard to the general public or conditions that might impair safe use of the facility.
 - 2. Coordinate the work of this section with that of all other trades. The Asbestos Abatement Subcontractor shall be available within 24 hour notice for additional work or rework if after acceptance of the work it is found that full abatement was not achieved from the initial work effort as determined by the Consultant.
 - 3. The Asbestos Abatement Subcontractor shall cooperate with the Consultant, and all other trades, and equipment suppliers working on the site, coordinate his/her work with work of others and proceed in a manner so as not to delay the progress of the project.
 - 4. The Asbestos Abatement Subcontractor shall coordinate his/her work with the progress of the work of other sub-trades so that the work shall be completed as soon as conditions permit. Any overtime hours worked or additional costs incurred due to lack of or improper coordination shall be assumed by the Asbestos Abatement Subcontractor without any additional cost to the Owner.

PART 2 – PRODUCTS

2.01 INTRODUCTION

- A. The work of this Section, without limiting the generality thereof, includes the furnishing of labor, materials, tools, equipment, services and incidentals necessary to complete all asbestos abatement in accordance with the Specifications. These Specifications are intended to describe, and provide for a finished and complete piece of work; work which is described by any portion of these documents shall be complete in every detail and in accordance with established trade practice, notwithstanding whether or not every item or detail necessarily involved is particularly mentioned.
- B. Approvals and Inspections. All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet this Section along with EPA, OSHA, and NIOSH regulations, as well as any other federal state, and local regulations. Where there exists an overlap of these regulations and guidelines, the most stringent regulation shall apply. All work performed by the Asbestos Abatement Subcontractor is further subject to approval of the Consultant.

2.02 MATERIALS

- A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

- B. Damaged or deteriorating materials shall not be used and shall be removed from the premises. Material that becomes contaminated with asbestos shall be decontaminated or disposed of as asbestos waste.
- C. Fire retardant polyethylene sheet in a roll size to minimize the frequency of joints, shall be delivered to job site with factory label indicating 4 or 6 mil as indicated in section 3.5 of this section.
- D. Polyethylene disposable bags shall be six (6) mil with pre-printed label. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.
- E. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.
- F. Surfactant (wetting agent) - shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent, and shall be mixed with water to provide a concentration of one (1) ounce surfactant to five (5) gallons of water or as directed by manufacturer.
- G. The Asbestos Abatement Subcontractor shall have available spray equipment capable of mixing wetting agent with water and capable of generating sufficient pressure and volume and having sufficient hose length to reach all areas with asbestos.
- H. Impermeable containers are to be used to receive and retain any asbestos-containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with OSHA Standard 29 CFR 1926.1101) Containers must be both air and watertight.
- I. Labels and signs, as required by OSHA Standard 29 CFR 1926.1101, shall be used.
- J. HEPA filtered local exhaust ventilation shall be utilized during the installation of enclosures and supports where asbestos- containing materials may be disturbed.

2.03 TOOLS AND EQUIPMENT

- A. Provide suitable tools for asbestos removal, encapsulation and enclosure.
- B. The Asbestos Abatement Subcontractor's air monitoring professional shall have air monitoring equipment of type and quantity to monitor operations and conduct personnel exposure surveillance per OSHA requirements.
- C. The Asbestos Abatement Subcontractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape, and air filters.
- D. The Asbestos Abatement Subcontractor shall have available sufficient electrical resources to adequately draw from the existing service enough power to supply their project.
- E. The Asbestos Abatement Subcontractor shall have available shower stalls and plumbing to support same to include sufficient hose length and drain system or an acceptable alternate.
- F. Vacuum units, of suitable size and capacities for project, shall have HEPA filter(s) capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter or larger. Asbestos Abatement Subcontractor will have reserve units so that the station system will operate continuously.

- G. Ladders or scaffolds shall be OSHA-approved and be of sufficient dimensions and quantities so that all work surfaces can be easily and safely accessed by the workers and inspectors. Scaffold joints and ends shall be sealed with tape to prevent incursion of asbestos fibers.
- H. Hand power tools shall be equipped with HEPA-filtered local exhaust ventilation if used to drill, cut into, or otherwise disturb ACM.
- I. All brushes shall have nylon bristles. Wire brushes are excluded from use due to their potential to shred asbestos fibers into small fibers. Wire brushes may be used on pipe joint applications upon prior written approval by the Consultant.
- J. Electrical equipment shall be Underwriters Laboratory listed and approved and shall have ground fault circuit interrupt protection that has been installed by a licensed electrician.

PART 3 – EXECUTION

3.01 ASBESTOS ABATEMENT SUBCONTRACTOR RESPONSIBILITIES

- A. The work specified in this contract entails the removal of asbestos-containing materials. This work shall be conducted by persons who are knowledgeable, qualified, and experienced in the removal, treatment, handling, and disposal of asbestos-containing materials and the subsequent cleaning of the environment. The Asbestos Abatement Subcontractor shall comply with all applicable federal, state, and local regulations that mandate work practices and shall be capable of performing the work within the specified time frame.
- B. The Asbestos Abatement Subcontractor shall supply all labor, materials, equipment, services and incidentals which are necessary or required to perform the work in accordance with all applicable governmental regulations and the specifications.
- C. The Asbestos Abatement Subcontractor shall be responsible for repairs to any damage to the Owner's buildings resulting from his work, actions, or negligence.
- D. Waste Receipts: Following the completion of the abatement project, the Asbestos Abatement Sub-Contractor shall be responsible for submitting waste manifest and work site worker sign-in sheets. All submittals shall be made in a timely fashion.
- E. Asbestos Abatement Subcontractor's Air Sampling Responsibility
 - 1. The Asbestos Abatement Sub-Contractor shall be responsible for monitoring airborne asbestos concentrations in the work zone and to establish conditions and work procedures for maintaining compliance with OSHA regulations 29 CFR 1910.1001 and 1926.1101.
 - 2. The Asbestos Abatement Subcontractor's air sampling professional shall document all air sampling results and provide a report to the Consultant 72 hours after sample collection.
 - 3. Air sampling shall be conducted in accordance with methods described in OSHA standards 29 CFR 1910.1001 and 1926.1101. Air samples shall be conducted in a manner that will provide a minimum detection limit of .01 fibers/ cc.
- F. Access: The Asbestos Abatement Subcontractor shall maintain control of and be responsible for access to work areas to ensure the following requirements:
 - 1. Non-essential personnel are prohibited from entering the area;
 - 2. All authorized personnel entering the work area shall read the "worker protection procedures" which are posted at the entry points to the work area, and shall be equipped with properly fitted respirators and protective clothing;
 - 3. All personnel who are exiting from the decontamination enclosure system shall be properly decontaminated;

4. Asbestos waste that is taken out of the work area must be properly bagged and labeled. The surface of the bags shall be decontaminated. Asbestos leaving the work area must be immediately transported off site at the end of each work day.
5. Any material, equipment, or supplies which are brought out of the decontamination enclosure system shall be cleaned and decontaminated by wet cleaning and/or HEPA vacuuming of all surfaces.

3.02 WORK AREA SAFETY

- A. Site Safety. The Asbestos Abatement Subcontractor is responsible for safety at the work site. This includes, but is not limited to electrical safety, mechanical (tool) safety, fire safety, and personnel protective safety. The Asbestos Abatement Subcontractor is advised that federal, state, and local regulations exist which govern safety on the work site. Therefore, in addition to the following, the Asbestos Abatement Subcontractor is responsible for adhering to the most stringent requirements in effect by any of the aforementioned entities or these Specifications.
- B. Work Site Safety Plan
 1. The Asbestos Abatement Subcontractor shall establish a work site safety plan that includes a set of emergency procedures and shall post them in a conspicuous place at the work site. The safety plan should include provisions for the following:
 - a) Confined Space entry procedures and proposed monitoring requirements.
 - b) Evacuation of injured workers
 - c) Emergency and fire exit routes from all work areas, including local telephone number for fire and medical emergency personnel
 - d) Copies of applicable insurance certificates
 - e) Employee work logs
 2. The Asbestos Abatement Subcontractor is responsible for training all workers in safety procedures. At a minimum, one employee on site shall be trained and certified in basic first aid by the American Red Cross or equivalent. A general first aid kit shall be maintained in the work area for treating minor medical problems.
- C. Access to Work Area. The Owner shall provide specific access as required during the project to the Asbestos Abatement Subcontractor and personnel assigned to the project.
 1. It shall also be the Asbestos Abatement Subcontractor responsibility to allow only authorized personnel as defined below into the work area, and to secure all assigned entrances and exits at the end of the work day so as to prevent unauthorized entry.
 2. Authorized personnel shall mean those permitted to enter into a regulated work area in accordance with 453 CMR 6.00 and OSHA regulation 29 CFR 1926.1101.
 3. The Asbestos Abatement Subcontractor shall maintain a bound log book in which any person entering or leaving the asbestos abatement work area must sign and enter the dates and times of entry and departure.

3.03 PROJECT MONITORING

- A. The Owner shall retain the services of an industrial hygiene firm (Consultant) to provide periodic project monitoring, final visual inspections and final air sampling during the course of asbestos removal activities. The Consultant shall collect and analyze air samples for final air clearance and may perform periodic spot checks during abatement to ensure adherence to contract documents at the discretion of the on-site licensed asbestos Project Monitor.

3.04 CONSULTANT'S RESPONSIBILITIES

- A. Air Sampling: The Consultant may provide evaluations of the air quality within the work area during removal of asbestos containing materials, using his/her best professional judgments in respect to the

background air quality established. If it is determined that the air quality within the work area has become contaminated from the project, he/she shall immediately inform the Asbestos Abatement Sub-Contractor to cease all removal operations and implement a work stoppage clean-up procedure.

- B. The following air sampling shall be conducted at the completion of abatement work.
1. Final Air Clearance. The Consultant shall collect final air samples inside the work area as appropriate for the work at the completion of abatement work for final air clearance. Samples shall be analyzed in accordance with requirements of Commonwealth of Massachusetts regulation 453 CMR 6.00.
 2. Analysis shall include a minimum of five (5) air samples inside the work area utilizing aggressive methods for analysis by phase contrast microscopy (PCM) using the NIOSH 7400 protocol. Final air clearance samples shall be collected as required utilizing aggressive air sampling techniques and to obtain a volume of 1,199 liters.
- C. Inspections: Inspections may be conducted throughout the progress of the abatement project on a periodic basis. Inspections may be conducted in order to document the progress of the abatement work as well as the procedures and practices employed by the Asbestos Abatement Subcontractor. The following inspections shall be conducted at the completion of the abatement work:
1. Final Inspection. A final inspection shall be conducted upon request of the Asbestos Abatement Subcontractor. If residual debris is identified during the course of the final inspection, the Asbestos Abatement Subcontractor shall re-clean in order to render the area "debris free."

3.05 WORK AREA PREPARATIONS – INTERIOR

- A. Where necessary, shut down electrical power, including receptacles and light fixtures. Under no circumstances during the decontamination procedures will lighting fixtures be permitted to be operating when the spraying of amended water may contact the fixture. Provide GFCI devices, temporary power, and temporary lighting installed in compliance with the applicable electrical codes. All installations are to be made by a licensed electrician.
- B. Shut down and/or isolate heating, cooling, and ventilation air systems or zones to prevent contamination and fiber dispersal to other areas of the structure. During the work, vents within the work area shall be "sealed" with duct tape and polyethylene sheeting.
- C. The Asbestos Abatement Subcontractor shall be responsible for removing furniture which remains in the work areas. The Asbestos Abatement Subcontractor shall pre-clean moveable objects within the proposed work areas using HEPA vacuum equipment and/or wet cleaning methods as appropriate and remove such objects from work areas to a temporary location.
- D. Perform selective demolition to ensure complete removal of asbestos-containing materials.
- E. Seal off all openings, including, but not limited to, windows, corridors, doorways, skylights, ducts, grills, diffusers, and any other penetration of the work areas, with two layers of polyethylene sheeting a minimum of six (6) mils thick, sealed with duct tape. This includes doorways and corridors that will not be used for passage during work areas and occupied areas.
- F. Pre-clean fixed objects within the work areas, using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and enclose with a minimum six (6) mil plastic sheeting sealed with duct tape.
- G. Clean the proposed work areas using HEPA vacuum equipment or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.

- H. After HEPA vacuum cleaning, cover fixed walls with two (2) layers of four (4) mil polyethylene sheeting to the floor level. Where fixed walls are not used, two layers of six (6) mil polyethylene sheeting will be applied to a rigid framework of wood, metal, or PVC.
- I. Where abatement work does not involve the removal of flooring materials or locations directly adjacent to work, cover the floor with two (2) layers of six-mil polyethylene sheeting. All overlaps shall be sealed with tape or spray adhesive.
- J. Maintain emergency and fire exits from the work areas, or establish alternate exits satisfactory to fire officials.
- K. Clean and remove ceiling mounted objects, such as lights and other items not sealed off, that interfere with asbestos abatement. Use hand held amended water spraying or HEPA vacuuming equipment during fixture removal to reduce settled fiber dispersal.
- L. Create pressure differential between work areas and uncontaminated areas by the use of acceptable negative air pressure equipment sufficient to provide four (4) air changes per hour and at least -0.02 inches water pressure differential on a water gauge. This includes work within mini-containments.
- M. Pre-clean movable objects within the proposed work areas using HEPA vacuum equipment and/or wet cleaning methods as appropriate and remove such objects from work areas to a temporary location.
- N. Post warning signs in accordance with 29 CFR 1926.1101 at all approaches to the work area. Signs shall be conspicuously posted to permit a person to read signs and take precautionary measures to avoid exposure to asbestos.

3.06 EXTERIOR ABATEMENT - WORK AREA PREPARATION

- A. Seal off all openings, including but not limited to windows, doors, ventilation openings, drains, grilles, diffuser grates, and any other penetration of the work areas, with polyethylene sheeting (minimum six (6) mils thick) sealed with tape.
- B. Work is to be conducted from building exterior and window openings shall be isolated from the building interior using two (2) independent layers of six-mil polyethylene sheeting sealed with tape or adhesive spray.
- C. Provide two (2) layers of six-mil polyethylene sheeting on exterior ground surface extending to a minimum of 10'-0" from building perimeter where window systems or caulking materials are to be removed. Movable lifts or staging platforms shall also be protected with two (2) layer layers of six-mil polyethylene sheeting.
- D. Pre-clean fixed objects within the work areas; using HEPA vacuum equipment and/or wet cleaning methods as appropriate, and enclose with a minimum of six (6) mil plastic sheeting sealed with tape.
- E. Clean the proposed work areas using HEPA vacuum equipment or wet cleaning methods as appropriate. Do not use methods that raise dust, such as dry sweeping or vacuuming with equipment not equipped with HEPA filters.
- F. Post warning signs in accordance with 29 CFR 1926.1101 at all approaches to the work area. Signs shall be conspicuously posted to permit a person to read signs and take precautionary measures to avoid exposure to asbestos.
- G. Maintain emergency and fire exits from the work area, or establish alternative exits satisfactory to fire officials.

3.07 DECONTAMINATION SYSTEM

- A. The Asbestos Abatement Subcontractor shall establish contiguous to the work area, a decontamination enclosure consisting of equipment room, shower room, and clean room in series. The only access between contaminated and uncontaminated areas shall be through this decontamination enclosure.
- B. Access between rooms in the decontamination system shall be through double flap curtain openings.
- C. Occupied areas and/or building space not within the work areas shall be separated from asbestos abatement work areas by means of airtight barriers.
- D. Construct the decontamination system with wood or metal framing, 3/8" sheathing and cover both sides with a double layer of six (6) mil polyethylene sheeting, spray glued or taped at the joints. Caulk joints watertight at floor, walls, and ceiling.
- E. The Asbestos Abatement Subcontractor shall visually inspect barrier several times daily to assure effective seal and the Asbestos Abatement Subcontractor shall repair defects immediately.
- F. A single-chamber decontamination unit shall be utilized (at a minimum) for each mini-enclosure containment established for spot removal of vinyl asbestos floor tile. A remote, three-chamber decontamination unit shall be established prior to asbestos removal within mini-enclosure containments.

3.08 ASBESTOS REMOVAL INTERIOR

- A. The Asbestos Abatement Subcontractor shall have a competent and qualified designated person on the project at all times to ensure establishing a proper enclosure system and proper work practices throughout the project.
- B. Spray asbestos materials with amended water using airless spray equipment or apply approved removal encapsulant to reduce the release of fibers during removal operation. Consultant shall pre-approve use of amended water or removal encapsulant.
- C. Fill disposal containers as removal proceeds. Seal filled containers and clean containers before removal to wash area. Wet clean each container thoroughly, double bag and apply proper labels before moving to Holding Area. Ensure that workers do not enter from uncontaminated areas into the Washroom or the work area.
- D. After completion of stripping work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work the surfaces being cleaned shall be kept wet.
- E. If at any time during asbestos removal, should the Owner's on-site monitor suspect contamination of areas outside the work area, they shall stop all abatement work until the Asbestos Abatement Subcontractor takes steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas until air sampling and visual inspections certify decontamination.
- F. Remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris.

- G. Sealed disposal containers and all equipment used in the work area shall be included in the cleanup and shall be removed from work areas. All asbestos waste shall be placed in six (6) mil polyethylene disposal bags, outside of bags shall be cleaned and they shall be placed in a second disposal bag (double-bagged) before removal for disposal. Clean all surfaces with HEPA filter vacuum equipment before wet cleaning all surfaces within regulated area.
- H. The Consultant shall conduct a post-abatement visual inspection with the containment barriers in place. If visible accumulations or any dust or bulk asbestos containing materials are found in the work area, the Asbestos Abatement Subcontractor shall repeat the cleaning until the area is in compliance, at the Asbestos Abatement Subcontractor's expense. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate cleanup of the work site.

3.09 ASBESTOS REMOVAL – EXTERIOR

- A. All roofing materials identified within the scope of required work are to be considered to contain asbestos until tested otherwise and are scheduled to be removed.
- B. The following work practices are required for removal of roofing materials and sealants.
 - 1. Roofing shall be removed to expose underlying substrate.
 - 2. Wet methods shall be used during removal of asbestos containing materials.
 - 3. Roofing materials and flashing and sealant tars shall be removed by methods of breaking, shearing or slicing only. Flashing and sealant tars can also be removed utilizing chemical removal methods.
 - 4. Upon removal, asbestos containing materials shall be wrapped in plastic sheeting, labeled as asbestos containing, and lowered to the ground via dust tight chute, crane, or hoist no later than the end of the work shift. Alternatively asbestos-containing materials may be double bagged at the roof and transported to ground.

3.10 DISPOSAL OF WASTE

- A. The disposal of asbestos-containing and/or asbestos contaminated material, supplies, rags, disposable clothing, respirator cartridges, etc., shall be in compliance with requirements of and authorized by the Commonwealth of Massachusetts (DEP) and USEPA.
- B. Disposal approvals shall be obtained prior to commencing asbestos removal.
- C. A copy of approved disposal authorization shall be provided to the Owner, Architect, and Consultant.
- D. Copies of all landfill receipts shall be retained by the Consultant as part of the project file. The receipts shall be signed by the landfill operator upon receipt, and the quantity of asbestos debris leaving the work site and arriving at the landfill acknowledged.
- E. All wash water and shower water shall be collected and filtered through a five micron filter to remove any asbestos debris.
- F. All asbestos debris shall be transported in covered sealed vans, boxes, or dumpsters which are physically isolated from the driver by an airtight barrier. All vehicles must be properly licensed to meet Commonwealth of Massachusetts DOT requirements.

END OF SECTION

SECTION 02 83 33:
REMOVAL AND DISPOSAL OF MATERIAL CONTAINING LEAD

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Related Information:
1. Division 02 – Selective Demolition
 2. Drawing AD1.1 identifying proposed extent of demolition and asbestos abatement work as prepared by Turowski2 Architecture, Inc. and Fuss & O'Neill EnviroScience, LLC, dated March 6, 2013.
 3. Limited Hazardous Building Materials Inspection report prepared by Fuss & O'Neill EnviroScience, LLC, dated February 1, 2013

1.2 SUMMARY OF WORK

- A. Work of this Section includes, requirements for worker protection and waste disposal related to renovations to occur at the Arlington High School Administrative Offices located in Arlington, Massachusetts. The procedures referenced herein shall be utilized during required renovation work specified elsewhere in the Architect Technical Specifications that will impact lead paint.
- B. Worker protection, training, and engineering controls referenced herein shall be strictly adhered to, until completion of an exposure assessment with results indicating exposures below the "Action Level". This section does not involve lead abatement, but identifies worker protection requirements for trades involved in the renovation and disposal procedures.
- C. The facility is not considered a "child occupied facility" or "target housing" and is therefore not subject to the requirements of the Department of Labor Standards for lead safe renovation. The work to be conducted may impact worker protection and waste must be properly disposed. Testing to confirm the presence or absence of lead paint has not been conducted and it shall be incumbent upon the general contractor and any sub-trades to determine potential worker exposures during proposed work. All work shall be conducted in accordance with 453 CMR 22.11 for renovation work involving potential disturbance of lead paint.
- D. Waste generated during the work will likely be in the form selective demolition and/or surface preparation for priming or painting of the following building materials:
- painted brick walls
 - painted plaster walls
 - wood window components
- Materials which are not metal shall be presumed hazardous waste or representative testing shall be performed utilizing the Toxicity Characteristic Leachate Procedure (TCLP) by the contractor disposing of such waste. Note paint chip debris from surface preparation shall be considered hazardous lead waste for disposal.

1.3 DEFINITIONS

The following definitions relative to lead paint as used in this Section are offered:

1. ACTION LEVEL (AL): The allowable employee exposure, without regard to use of respiratory protection, to an airborne concentration of lead over an eight (8) hour time weighted average

- (TWA), as defined by OSHA. The current action level is thirty micrograms per cubic meter of air (30 ug/m³).
2. AREA MONITORING: The sampling of lead concentrations, which is representative of the airborne lead concentrations that may reach the breathing zone of personnel potentially exposed to lead.
 3. BIOLOGICAL MONITORING: The analysis of a person's blood and/or urine, to determine the level of lead concentration in the body.
 4. CHANGE ROOM: An area provided with separate facilities for clean protective work clothing and equipment and for street clothes, which prevents cross contamination.
 5. COMPETENT PERSON: A person employed by the Contractor who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions, and who has authorization to take prompt corrective measures to eliminate them as defined by OSHA.
 6. DANGEROUS LEVEL OF LEAD: A level of lead, when present in dried paint or plaster, contains more than 0.50% lead by dry weight as measured by atomic absorption spectrophotometry (AAS) or 1.0 mg/cm² as measured by on site testing utilizing an x ray fluorescence analyzer. (Term is specific to Commonwealth of Massachusetts regulations and HUD guidelines only)
 7. EXPOSURE ASSESSMENT: An assessment conducted by an employer to determine if any employee may be exposed to lead at or above the action level.
 8. "HIGH EFFICIENCY PARTICULATE AIR" (HEPA): A type of filtering system capable of filtering out particles of 0.3 microns diameter from a body of air at 99.97% efficiency or greater.
 9. LEAD: Refers to metallic lead, inorganic lead compounds and organic lead soaps. Excluded from this definition are other organic lead compounds.
 10. LEAD WORK AREA: An area enclosed in a manner to prevent the spread of lead dust, paint chips, or debris resulting from lead containing paint disturbance.
 11. LEAD PAINT: Refers to paints, glazes and other surface coverings containing a toxic level of lead.
 12. PERMISSIBLE EXPOSURE LIMIT (PEL): The maximum allowable limit of exposure to an airborne concentration of lead over an eight (8) hour time weighted average (TWA), as defined by OSHA. The current PEL is fifty micrograms per cubic meter of air (50 ug/m³). Extended workdays lower the PEL by the formula: PEL equals 400 divided by the number of hours of work.
 13. PERSONAL MONITORING: Sampling of lead concentrations within the breathing zone of an employee to determine the 8 hour time weighted average concentration in accordance with 29 CFR 1926.62 and 29 CFR 1910.1025. Samples shall be representative of the employee's work tasks. Breathing zone shall be considered an area within a sphere with a radius of 18 inches and centered at the nose or mouth of an employee.
 14. RESOURCE CONSERVATION RECOVERY ACT (RCRA): RCRA establishes regulatory levels of hazardous chemicals. There are eight (8) heavy metals of concern for disposal: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Six (6) of the metals are typically found in paints, excluding selenium and silver.
 15. TOXICITY CHARACTERISTIC LEACHATE PROCEDURE (TCLP): The U.S. Environmental Protection Agency (USEPA) required sample preparation and analysis for determining the hazard characteristics of a waste material.

1.4 REGULATIONS AND STANDARDS

The following regulations, standards, and ordinances of Federal, State, and local agencies are applicable and made a part of this specification by reference:

1. American National Standards Institute (ANSI)
 - a. ANSI 288.2 1980 Respiratory Protection
1. Code of Federal Regulation (CFR)
 - a. 29 CFR 1910.134 Respiratory Protection
 - b. 29 CFR 1910.1025 Lead
 - c. 29 CFR 1926.62 Lead in Construction Interim Final Rule
 - d. 29 CFR 1910.1200 Hazard Communication

- e. 29 CFR 1926.59 Hazard Communication in Construction
- f. 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists
- g. 29 CFR 1926.57 Ventilation
- h. 40 CFR 260 Hazardous Waste Management Systems: General
- i. 40 CFR 261 Identification and Listing of Hazardous Waste
- j. 40 CFR 262 Generators of Hazardous Waste
- k. 40 CFR 263 Transporters of Hazardous Waste
- l. 40 CFR 264 Owner and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- m. 40 CFR 265 Interim Statutes for Owner and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- n. 40 CFR 268 Lead Disposal Restrictions
- o. 40 CFR 172 Hazardous Materials Tables and Communication Regulations
- p. 40 CFR 178 Shipping Container Specifications
- q. 40 CFR 270 and 124 Hazardous Waste Permits
2. Commonwealth of Massachusetts Regulations
 - a. 454 CMR 22.11
3. Underwriters Laboratories, Inc. (UL)
 - a. UL586 1990 High Efficiency Particulate Air Filter Units

1.5 QUALITY ASSURANCE

A. Hazard Communication Program

The Contractor shall establish and implement a Hazard Communication Program as required by 29 CFR 1926.59.

B. Compliance Plan (Site Specific)

The contractor shall establish a written compliance plan, which is specific to the project site, to include the following:

1. A description of work activity involving lead including equipment used, material included, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices.
2. Methods of engineering controls to be used to control lead exposure.
3. The proposed technology the Contractor will implement in meeting the PEL.
4. Air monitoring data documenting the source of lead emissions.
5. A detailed schedule for implementing the program, including documentation of appropriate supply of equipment, etc.
6. Proposed work practice which establishes proper protective work clothing, housekeeping methods, hygiene facilities, and practices.
7. Worker rotation schedule, if proposed, to reduce TWA.
8. A description of methods for informing workers of potential lead exposure.

C. Hazardous Waste Management

The Contractor shall establish a Hazardous Waste Management Plan, which shall comply with applicable regulations and address the following:

1. Identification of hazardous wastes
2. Estimated quantity of waste to be disposed of
3. Names and qualifications of each subcontractor that will be transporting, storing, treating, and disposing of wastes
4. Disposal facility location and 24 hour point of contact
5. Establish EPA State hazardous waste and identification numbers if applicable

6. Names and qualifications (experience and training) of personnel who will be working on site with hazardous wastes
 7. List of waste handling equipment to be used in performing the work to include cleaning, volume reduction, if applicable, and transport equipment
 8. Qualifications of laboratory to be utilized for TCLP sampling and analysis
 9. Spill prevention, containment, and cleanup contingency measures
 10. Work plan and schedule for waste containment, removal, treatment, and disposal
- D. Medical Examinations
1. Before exposure to lead contaminated dust, provide workers with a comprehensive medical examination as required by 29 CFR 1910.1025 and 29 CFR 1926.62.
 2. The examination shall not be required if adequate records show that employees have been examined as required by 29 CFR 1926.62 within the last year.
 3. Medical examination shall include, at a minimum, approval to wear respiratory protection and biological monitoring.
- E. Training
1. The Contractor shall ensure that workers are trained to perform lead paint disturbing activities and disposal operations prior to the start of work in accordance with 29 CFR 1926.62.
- F. Respiratory Protection Program
1. The Contractor shall furnish each employee required to wear a negative pressure respirator with a respirator fit test at the time of initial fitting and at least once every six (6) months thereafter as required by 29 CFR 1926.62.
 2. The Contractor shall establish a Respiratory Protection Program in accordance with ANSI Z88.2, 29 CFR 1910.134, and 29 CFR 1926.62.

1.6 SUBMITTALS

- A. The Contractor shall submit to the Owner's Authorized Representative the following submittals prior to start of work:
1. Copies of medical records for each employee to be used on the project, including results of biological monitoring and a notarized statement by the examining physician that such an examination took place.
 2. Copies of workers' training certificates.
 3. Submit record of successful respirator fit testing performed by a qualified individual within the previous six (6) months, for each employee to be used on this project with the employee's name and social security number with each record.
 4. The name and address of Contractor's blood lead testing lab, OSHA CDC listing, and Certification in the Commonwealth of Massachusetts.
 5. The name and address of Contractor's personal air monitoring and waste disposal lead testing laboratory/ies.
 6. Name, address, and ID number of the hazardous waste hauler, waste transfer route, and proposed disposal site.
- B. The Contractor shall submit to the Owner's Authorized Representative the following submittals during the job:
1. Results from personal air samples.
 2. Medicals, certificates, and fit test 24 hours in advance of any new employee starting on the project.
- C. The Contractor shall submit to the Owner's Authorized Representative the following submittals upon completion of the work:

1. Copies of manifests and receipts acknowledging disposal of all hazardous waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative.

1.7 PERSONAL PROTECTION

A. Exposure Assessment

1. The Contractor shall determine if any worker will be exposed to lead at or above the action level.
2. The exposure assessment shall identify the level of exposure a worker would be subjected to without respiratory protection.
3. The exposure assessment shall be achieved by obtaining personal monitoring samples representative of a full shift at least (8 hour TWA).
4. During the period of the exposure assessment, the Contractor shall institute the following procedures for protection of workers.
 - a. Protective clothing shall be utilized
 - b. Respiratory protection
 - c. Change areas shall be provided
 - d. Hand-washing facilities and shower
 - e. Biological monitoring
 - f. Training of workers

B. Respiratory Protection

1. The Contractor shall furnish appropriate respirators approved by NIOSH/MSHA for use in atmospheres containing lead dust.
2. Respirators shall comply with the requirements of 29 CFR 1926.62.
3. Workers shall be instructed in all aspects of respiratory protection.
4. The Contractor shall have an adequate supply of HEPA filter elements and spare parts on site for all types of respirators in use.
5. The following minimum respirator protection for use during paint removal or demolition of components and surfaces with lead paint shall be the 1/2 mask air purifying respirator with high efficiency filters for exposures (not in excess of 500 ug/m³ or 10 x PEL).

C. Protective Clothing

1. Personal protective clothing shall be provided for all workers, supervisors, and authorized visitors entering the work area.
2. Each worker shall be provided with a minimum of two (2) complete disposable coverall suits.
3. Removal workers shall not be limited to two (2) suits, and the Contractor shall supply additional suits as necessary.
4. Under no circumstances shall anyone entering the abatement area be allowed to re-use a contaminated disposable suit.
5. Disposable suits, such as TYVEK suits, and other personal protective equipment (PPE) shall be donned prior to entering the lead control area. A change room shall be provided for workers to put on suits and other personal protective equipment with separate areas to store their street clothes.
6. Eye protection for personnel engaged in lead operations shall be furnished when the use of a full-face respirator is not required.
7. Goggles with side shields shall be worn when working with power tools or a material that may splash or fragment, or if protective eye wear is specified on the Material Safety Data Sheet (MSDS) for a particular product to be used on the project.

1.8 PERSONAL MONITORING

- A. General. The Contractor is required to perform the personal air sampling activities during lead paint disturbing work. The results of such sampling shall be posted, provided to individual workers and submitted to the Owner's Authorized Representative as described herein.
- B. Sampling. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken every day after the first day if working conditions remain unchanged, but must be taken every time there is a change in removal operations, either in terms of the location or the type of work. Sampling will be used to determine eight hour Time weighted averages (TWA). The Contractor is responsible for personal sampling as outlined in OSHA Standard 29 CFR 1926.62 and 29 CFR 1910.1025.
- C. Sampling Results. Air sampling results shall be reported to individual workers in written form no more than forty eight (48) hours after the completion of a sampling cycle. The reporting document shall list each sample's result, sampling time and date, personnel monitored and their social security numbers, flow rate, sample duration, sample yield, cassette size, and analysts' name and company, and shall include an interpretation of the results. Air sample analysis results will be reported in micrograms/cubic meter (ug/m³).
- D. Testing Laboratory. The Contractor's testing lab shall be participating in AIHA's Environmental Lead Laboratory Accreditation Program (ELLAP). The Contractor shall submit to the Owner's Authorized Representative for review and acceptance, the name and address of the laboratory, certification(s) of AIHA participation, a listing of relevant experience in air lead analysis, and presentation of a documented Quality Assurance and Quality Control Program.

PART 2 PRODUCTS

2.1 GENERAL

- A. Any substitution in materials, equipment, or methods to those specified shall be approved by the Owner's Authorized Representative prior to use. Any requests for substitution shall be provided in writing to the Owner's Authorized Representative. The request shall clearly state the rationale for the substitution.
- B. Submit to the Owner's Authorized Representative product data of all materials and equipment and samples of all materials to be considered as an alternate.
- C. Product data shall consist of manufacturer; catalog sheets, brochures, diagrams, schedules, performance charts, illustrations, material safety data sheets (MSDS), and other standard descriptive data. Submittal data shall be clearly marked to identify pertinent materials, products or equipment and show performance characteristics and capacities.
- D. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product or material with integrally related parts and attachment devices.

2.2 MATERIALS AND PRODUCTS

- A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.
- B. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

- C. The Contractor shall have available sufficient inventory or dated purchase orders for materials necessary for the job including protective clothing, respirators, filter cartridges, polyethylene sheeting of proper size and thickness, tape, and air filters.
- D. Materials
 - 1. Polyethylene sheet in a roll size to minimize the frequency of joints shall be delivered to job site with factory label indicating 6 mil.
 - 2. Polyethylene disposable bags shall be six (6) mil. Tie wraps for bags shall be plastic, five (5) inches long (minimum), pointed and looped to secure filled plastic bags.
 - 3. Tape or adhesive spray will be capable of sealing joints in adjacent polyethylene sheets and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.
 - 4. Impermeable containers are to be used to receive and retain any lead containing or contaminated materials until disposal at an acceptable disposal site. (The containers shall be labeled in accordance with EPA and DOT standards.)
 - 5. HEPA filtered exhaust systems shall be used during powered dust generating abatement operations. The use of powered equipment without HEPA exhausts is prohibited.

2.3 TOOLS AND EQUIPMENT

- A. Provide suitable tools for all lead disturbing operations.
- B. The Contractor shall have available power cables or sources such as generators (where required).
- C. Vacuum units, of suitable size and capacities for the project, shall have HEPA filter(s) capable of trapping and retaining 99.97% of all mono-dispersed particles of 0.3 micrometers in diameter.

PART 3 EXECUTIONS

3.1 WORKER PROTECTION/TRAINING

- A. The Contractor shall provide appropriate training, respiratory and other personal protection, and biological monitoring for each worker and ensure proper usage during potential lead exposure and the initial exposure assessment.

3.2 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor is responsible for establishing and maintaining controls referenced herein to prevent dispersal of lead contamination from the lead work area.
- B. The Contractor is also responsible for conducting work with applicable Federal, State, and local regulations as referenced herein.

3.3 WORKER HYGIENE PRACTICES (Required during initial exposure assessment and if results of air sampling are above OSHA Action Level)

- A. Work Area Entry. Workers shall don personal protective equipment prior to entering work area, including respiratory protection, disposable coveralls, gloves, headgear, and footwear.
- B. Work Area Departure. While leaving respirators on, workers shall remove all gross contamination, debris, and dust from disposable coveralls and proceed to change room and remove coveralls and footwear and place in hazardous waste disposal container.
- C. Handwashing Facilities. All workers must wash their hands and faces upon leaving the work area.

- D. Equipment. All equipment used by workers inside the work area shall be wet wiped or bagged for later decontamination before removal from the work area.
- E. Prohibited Activities. Under no circumstances shall workers eat, drink, smoke, chew gum, or tobacco, or remove their respirators in the work area.
- F. Shock Hazards. The Contractor is responsible for using safe procedures to avoid electrical hazards. All temporary electrical wiring will be protected by ground fault circuit interrupters (GFI).

3.4 LEAD WORK AREA (Required during initial exposure assessment and if results of air sampling are above OSHA Action Level)

- A. The Contractor shall place warning signs at all entrances and exits from the work area. Signage shall be a minimum of 20" x 14" and shall state the following:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING OR DRINKING
UNAUTHORIZED ENTRY PROHIBITED

- B. The Contractor shall designate a change room as specified in this Section. The change room shall consist of two (2) layers of sheeting on the floor surface adjacent to the lead work area. The change room shall have separate storage facilities for street clothes to avoid cross contamination.
- C. The Contractor shall provide potable water for hand and face washing and provide a portable shower unit.
- D. The Contractor shall place six mil polyethylene drop clothes on floor/ ground surfaces prior to beginning removal work to facilitate clean up.

3.5 WORK AREA CLEAN UP

- A. The Contractor shall remove all loose chips and debris from floor/ground surfaces and place in hazardous waste disposal bags.
- B. The Contractor shall HEPA vacuum adjacent surfaces to remove dust and debris.
- C. Polyethylene drop cloths shall be properly disposed of.

3.6 WASTE DISPOSAL

- A. Waste generated during the work will likely be in the form selective demolition and/or surface preparation for priming or painting of the following building materials:

- painted brick walls
- painted plaster walls
- wood window components

Materials which are not metal shall be presumed hazardous waste or representative testing shall be performed utilizing the Toxicity Characteristic Leachate Procedure (TCLP) by the contractor disposing of such waste. Note paint chip debris from surface preparation shall be considered hazardous lead waste for disposal.

- B. Cost for disposal of hazardous lead paint chip debris shall be included in the bid.
- C. The Contractor's contractual liability shall be the proper disposal of all non-hazardous and hazardous wastes generated at the site in accordance with all applicable Federal, State, and local regulations as referenced herein. Contractor shall be responsible for waste characterization utilizing TCLP for generated waste. Contractor shall include amount of presumed hazardous waste for disposal in base bid.

END OF SECTION

SECTION 02 84 16:
HANDLING OF LIGHTING BALLASTS AND LAMPS CONTAINING PCBS AND MERCURY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Related Information:
 - 1. Division 02 – Selective Demolition
 - 2. Drawing AD1.1 identifying proposed extent of demolition and asbestos abatement work as prepared by Turowski2 Architecture, Inc. and Fuss & O'Neill EnviroScience, LLC, dated March 6, 2013.
 - 3. Limited Hazardous Building Materials Inspection report prepared by Fuss & O'Neill EnviroScience, LLC, dated February 1, 2013

1.2 SUMMARY OF WORK

- A. The scope of abatement work is work necessary to facilitate removal of existing architectural and electrical systems specified to be demolished as part of the renovation and abatement work at the Arlington High School – Administrative Offices in Arlington, MA.
- B. Fluorescent Light Ballasts: Work of this Section includes, but is not necessarily limited to, all which is necessary for complete removal and disposal of all Non-PCB diethylhexyl phthalate (DEHP) containing ballasts. Work shall be performed related to selective demolition work necessary to facilitate renovations. Ballasts that are to be removed shall be recycled/disposed as non-PCB containing if they have "No PCB" labels.
- C. Fluorescent Lamps and Mercury Equipment: Work of this Section includes, but is not necessarily limited to, all which is necessary for complete removal and disposal of all presumed mercury containing fluorescent lamps and mercury equipment which includes thermostats that exist in the interior of the buildings to be renovated. Fluorescent and lamps that are to be removed shall be recycled/disposed as universal wastes.
- D. The extent of electrical demolition is specified elsewhere in the contract documents and Contractor shall coordinate this section with other sections for the actual quantities of the work required. Only ballasts on light fixtures proposed for demolition require removal.
- E. The Contractor is responsible for verification of actual quantities of the above items requiring removal and disposal. This verification shall include an on-site walk-through of the work areas and visually inspecting ballasts for the presence of labels indicating "No PCB". Note if ballasts are identified which do not have labels indicating "No PCB" they shall be disposed/recycled as presumed PCB containing.

1.3 REGULATIONS AND STANDARDS

- A. The following regulations and standards of federal and state agencies apply to the disposal of ballasts, and are made part of this Specification by reference.
 - 1. Toxic Substance Control Act (TSCA) (40 CFR Part 761).
 - 2. Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Law).
 - 3. Department of Transportation (DOT) regulations - DOT regulation HM-181 regulates transportation of hazardous materials, including PCBs.

4. Occupational Safety and Health Administration (OSHA) - OSHA regulates workers' safety and exposure to a variety of chemicals including PCBs.
5. Resource Conservation and Recovery Act (RCRA) - RCRA regulates wastes which fail Toxic Characteristic Leachate Procedure (TCLP) and which contain more than 50 ppm of PCBs.

B. The following regulations and standards of federal and state agencies apply to the disposal of universal waste (fluorescent lamps), and mercury containing equipment are made part of this Specification by reference.

1. Resource Conservation and Recovery Act (RCRA) - 40 CFR Part 261, Subpart C.
2. RCRA - 40 CFR Part 273.
3. Comprehensive Environmental Response, Compensation, and Liability Act (Superfund Law).
4. Department of Transportation (DOT) regulations – Pipeline and Hazardous Materials Safety Administration regulation 49 CFR 100-185 as applicable.
5. Occupational Safety and Health Administration (OSHA) – 29 CFR 1910.1200 Hazard Communications and 29 CFR 1926.65.

1.4 SUBMITTALS

A. The Contractor shall submit to the Hazardous Materials Consultant the following submittals prior to start of work:

1. Proposed transporter for PCB and non-PCB wastes generated as part of the project, including licenses as required.
2. Proposed disposal/recycling facility proposed for PCB and non-PCB waste generated as part of the project.
3. Proposed transporter for mercury containing universal wastes generated as part of the project, including licenses as required.
4. Proposed disposal/recycling facility proposed for mercury containing waste generated as part of the project.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name and product technical description.

PART 3 - EXECUTION

3.1 BALLAST REMOVAL AND PACKAGING

- A. The Contractor shall remove all ballasts from light fixtures with care.
- B. The Contractor shall pack all ballasts in appropriately sized containers or drums with care, so as not to cause ballasts to leak as a direct result of removal and packing.
- C. The Contractor shall segregate all leaking ballasts from non-leaking ballasts, separately package leaking ballasts in plastic bags and individually drum.
- D. The Contractor shall label all drums properly. The Contractor shall supply labels. Labels shall contain the following information:
 1. Contents of drum
 2. DOT description
 3. Name, address, and telephone number of the Owner (i.e., the Generator)

4. Emergency telephone numbers
 5. Date on which drum was filled with ballasts
 6. Class 9 label
- E. The Contractor shall ensure that no other material or waste is contained in the drums except the ballasts from fluorescent light fixtures.
- F. The Contractor shall not load drum with more than 750 pounds of gross weight.
- G. The Contractor shall not use any absorbent material to pack ballasts in drums.
- H. The Contractor shall not use any plastic liners in drums.
- I. Each drum shall be sealed and stored in a secure area to minimize inadvertent damage or vandalism.
- J. The ballasts will be removed by personnel wearing chemically resistant gloves, eye protection, and proper respiratory protection.

3.2 DISPOSAL OF BALLASTS

- A. At the completion of the removal phase of the project, a transporter licensed to haul either PCB or non-PCB waste shall be contracted for disposal of the waste generated by the project work. Chain of custody records shall be maintained which include the date of pickup, number of drums, name of the transporter, and destination of waste for disposal. The Contractor shall be responsible for all disposal costs associated with the waste generated during this project.
- B. The Contractor shall provide a Certificate of Recycling and Disposal (CRD) pursuant to 40 CFR Part 761 Subpart K.
- C. The Contractor shall provide waste shipment records and disposal manifests for all PCB and non-PCB wastes generated and disposed from the project site. The Owner shall be provided sufficient time to identify agent for signatures on waste documentation. Contractor shall provide waste manifest to generation and destination state as required and provide Owner (Generator copy to agent signing manifests).

3.3 COLLECTION AND CONTAINMENT MERCURY LAMPS AND EQUIPMENT

- A. All fluorescent lamps to be removed are to be considered mercury-containing. Lamps are to be handled by personnel wearing gloves and eye protection for protection against glass breakage, and proper respiratory protection. Lamps are to be stored unbroken in DOT approved containers that protect the lamps against breakage.

3.4 STORAGE AND DISPOSAL/RECYCLING OF MERCURY LAMPS AND EQUIPMENT

- A. Each container shall be sealed and stored in a secure area to minimize inadvertent damage or vandalism. Each lamp or a container or package in which such lamps are contained must be labeled or marked clearly with one of the following phrases: "Universal Waste -- Lamp(s)," or "Waste Lamp(s)," or "Used Lamp(s)".
- B. At the completion of the mercury removal phase of the project, a transporter licensed to haul mercury-containing waste shall be contracted for disposal/recycling of the mercury waste. Chain of custody records shall be maintained which include the date of pick-up, number of containers, name of Mercury transporter, and destination of Mercury waste disposal. The Contractor shall be responsible for all disposal/recycling costs associated with the Mercury waste generated during this project.

- C. The Owner shall be provided a minimum of 72 hour notice of requirement for signature to identify agent for signatures on waste documentation. Contractor shall provide waste manifest to generation and destination state as required and provide Owner (Generator copy to agent signing manifests) and Hazardous Materials Consultant.

END OF SECTION

SECTION 05 50 00: METAL FABRICATIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. All Work in this Section, including Schedule in Paragraph 2.2 of this Section.
- B. Alternates: Refer to Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 099000 - PAINTING AND COATING for field painting work of this section.

1.3 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night time-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Paint products.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.
 - 1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
 - 2. Provide templates for anchors and bolts specified for installation under other Sections.
 - 3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the jurisdiction where Project is located, responsible for their preparation.
 - 4. Where fabrications are to receive sprayed-on fireproofing, include statement that primer is compatible with fireproofing proposed for use.
- C. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1, "Structural Welding Code--Steel."
 - 2. AWS D1.3, "Structural Welding Code--Sheet Steel."
- B. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
 - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
 - 2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

- A. Coordinate installation of anchorages for metal fabrications. 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.
- B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 SCHEDULE

- A. Miscellaneous and ornamental items include the following. Requirements for materials, hot-dip galvanizing, and shop-applied primers are included with each item as applicable.
 - 1. Galvanized roof edge rail.

2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, sizes as indicated on the Drawings.
- C. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- D. Steel Tubing: ASTM A 500, cold-formed steel tubing, sizes as indicated on the Drawings.

- E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, sizes as indicated on the Drawings.
 - 1. Provide Schedule 80 pipe for bollards.
- F. Slotted Channel Framing: Cold-formed metal channels with continuous slot complying with MFMA-3.
- G. Expanded-Metal Galvanized Steel: ASTM F 1267, Class 2, Grade A.

2.3 FASTENERS

- A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
- C. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Acceptable Manufacturers: Kwik-Bolt 3 by Hilti, Inc., TruBolt Wedge Anchor by ITW Red Head or Power-Stud by Powers Fasteners.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
 - 1. Provide interior, field-applied paint with a VOC content of 250 g/L or less, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.

3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
1. Fabricate units from slotted channel framing where indicated.
 2. Furnish inserts if units are installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

2.7 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architecture and Metal Products" recommendations for applying and designating finishes.
- B. Finish metal fabrications after assembly.

2.8 STEEL PRIMERS AND FINISHES

- A. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware. Provide thickness of galvanizing specified in referenced standards. The galvanizing bath shall contain high grade zinc and other earthly materials. Fill vent holes and grind smooth after galvanizing.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal

fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.
- E. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION

SECTION 06 10 00: CARPENTRY

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Wood blocking, cants, nailers, and grounds, including built-up wood fascia and rakes for aluminum covering.
 - 2. Plywood panels.
 - 3. Wood caps.
 - 4. Interior woodwork.
- B. Alternates: Alternates 1 and Alternates 2.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 092110 – GYPSUM BOARD ASSEMBLIES.

1.3 SUBMITTALS

- A. Schedule of Products:
 - 1. Indicate size, grade, and species of all wood products to be used on the project.
 - 2. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 3. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials, both before and after exposure to elevated temperatures when tested according to ASTM D 5516 and ASTM D 5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that

periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 3. All framing members shall be dressed four sides (S4S) Spruce-Pine-Fur (SPF) Number 2 unless noted otherwise (KD-19) 19% Maximum Moisture Content (Fb=875 psi).
 - 4. Where in contact with masonry or concrete, provide preservative treated lumber.
- B. Plywood Panels:
 - 1. Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.
 - 2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
 - 3. Factory mark panels according to indicated standard.

2.2 FINISH TRIM

- A. Provide point grade Poplar, 545.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
 - 2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
- B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete in exterior walls.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. General: For all interior use materials, provide materials that are fire-retardant treated and comply with performance requirements in AWWPA C20 (lumber) and AWWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
 2. Use treatment that does not promote corrosion of metal fasteners.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction, including the following:
 1. Rooftop equipment bases and support curbs.
 2. Blocking.
 3. Cants.
 4. Nailers.
 5. Furring.
 6. Grounds.
- B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.6 PANEL PRODUCTS

- A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.
- B. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2 inch thick.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
 1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Fasteners for Concrete: Self-tapping, corrosion-resistant; Tapcon or equal.
- F. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and

reamer wings, length as recommended by screw manufacturer for material being fastened.

- G. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.
- H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.8 MISCELLANEOUS MATERIALS

- A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
 - 1. Use adhesives that have a VOC content of 30 g/L or less when calculated according to Methods approved for LEED-S IEQ CR 4.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- C. Apply field treatment complying with AWWA M4 to cut surfaces of preservative-treated lumber and plywood.
- D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.
- E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.
- F. Use fasteners of appropriate type and length. Pre-drill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved and with Owner's future work.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION

SECTION 07 01 50: MODIFICATIONS TO EXISTING ROOFING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Modify existing roofing systems as required to accommodate new construction or equipment removal.
- B. Alternates: Refer to Section 012300 - ALTERNATES for requirements.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 061000 - CARPENTRY for wood nailers, curbs, and blocking.
 - 2. Section 079200 - JOINT SEALANTS for sealants.
 - 3. Division 22 - PLUMBING for roof drains.
 - 4. Division 23 - HEATING, VENTILATING, AND AIR CONDITIONING for roof curbs for HVAC equipment.
 - 5. Division 26 – ELECTRICAL for through roof connection.

1.3 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based

on testing and field experience. Roofing System Design: Roofing system shall be designed to withstand Code required loads and wind speeds.

- D. Flashings: Provide base flashings, perimeter flashings, detail flashings and component materials that comply with requirements and recommendations in FMG 1-49 Loss Prevention Data Sheet for Perimeter Flashings; FMG 1-29 Loss Prevention Data Sheet for Above Deck Roof Components; NRCA Roofing and Waterproofing Manual (Fourth Edition) for Construction Details and SMACNA Architectural Sheet Metal Manual (Fifth Edition) for Construction Details, as applicable.
- E. Certification: Upon completion of work of this Section, submit certification by existing roof manufacturer acknowledging that all work performed is acceptable.
- F. Contractor is responsible to investigate existing roof system and to provide all necessary labor and components to modify the existing roof to meet the requirements of the project.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work.
- C. Installer Certificates: Signed by roofing system manufacturer certifying that installer is approved, authorized, or licensed by manufacturer to install roofing system.
- D. Qualification Data: For Installer and manufacturer.
- E. Maintenance Data: For roofing system to include in maintenance manuals.
- F. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- B. Pre-installation Conference: Conduct conference at Project site. Comply with requirements in Division 01. Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with the Architect, Owner, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

- A. Roofing Contractor's Warranty: The roofing subcontractor shall supply Owner with a minimum two-year workmanship warranty for each roof. In the event any work related to the roofing, roofing contractor shall remove and replace such at no additional cost to the Owner. A copy of the roofing signed warranty shall be sent to the roofing system's manufacturer.
 1. The duration of the Roofing Contractor's two-year warranty shall run concurrent with the roofing system's manufacturer's existing warranty.
- B. Roofing Systems Manufacturer's Warranty: Maintain existing warranties. Coordinate with Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Compatibility: Provide products recommended by manufacturers to be fully compatible with indicated substrates. Provide separation materials as required to eliminate contact between incompatible materials.
 - 1. Furnish specific product acceptable to manufacturer of roofing membrane which will not compromise the roofing manufacturer's warranty.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing. Insulation, and cover boards are not exposed to precipitation or left exposed at the end of the workday.

3.3 UNDERLAYMENT INSTALLATION

- A. Install underlayment board in a single layer over area to roof deck substrate with mechanical fasteners.

3.4 VAPOR-RETARDER INSTALLATION

- A. Install laminated-sheet vapor retarder in a single layer over area to receive vapor retarder, side and end lapping each sheet a minimum of 2 inches and 6 inches respectively. Stagger joints from underlayment board layer below. Bond vapor retarder to underlayment board as follows:

1. Apply adhesive at rate recommended by vapor-retarder manufacturer. Seal laps with adhesive.
- B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.5 INSULATION AND COVERBOARD INSTALLATION

- A. Comply with membrane roofing system manufacturer's written instructions for installing roof insulation.
- B. Install tapered insulation under area of roofing to conform to slopes indicated.
- C. Install layers of insulation under area of roofing to achieve required thickness. Install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- D. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- E. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- F. Adhesively Applied Insulation: Install each layer of insulation and secure to deck using adhesive specifically designed and sized for adhering specified board-type roof insulation to deck type.
 1. Adhere insulation according to requirements in FMG's "Approval Guide" for specified Windstorm Resistance Classification.
 2. Adhere insulation to resist uplift pressure at corners, perimeter, and field of roof.
- G. Install cover board in a single layer over area to roof deck substrate as indicated. Stagger joints from insulation layer below.

3.6 ADHERED ROOFING MEMBRANE INSTALLATION

- A. Install roofing membrane over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll roofing membrane and allow to relax before installing.
- B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply solvent-based bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing

membrane. Do not apply bonding adhesive to splice area of roofing membrane.

- E. Mechanically or adhesively fasten roofing membrane securely at terminations, penetrations, and perimeter of roofing.
- F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.
- G. Seams: Clean seam areas, overlap roofing membrane, and hot-air weld side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roofing membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing membrane that does not meet requirements.
- H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply solvent-based bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.
- E. Terminate and seal top of sheet flashings.

3.8 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports. Manufacturer's Technical Representative: Engage a qualified manufacturer's technical representative to perform roof tests and inspections and to prepare test reports.

- C. Final Roof Inspection: Engage roofing system manufacturer's technical personnel to inspect roofing installation on completion and submit report to Architect.
 - 1. Notify Architect and the Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and the Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION

SECTION 07 84 10: PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.
- B. Related Work: The following items are not included in this Section and will be performed under the designated Sections:
 - 1. Section 079200 - JOINT SEALANTS for standard joint sealers.
 - 2. Division 21 - FIRE PROTECTION for fire-suppression piping penetrations.
 - 3. Division 22 - PLUMBING for piping penetrations.
 - 4. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for duct and piping penetrations.
 - 5. Division 26 - ELECTRICAL for cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated, as determined per ASTM E 814.
- C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.

- B. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.

- C. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - 1. Types of penetrating items.
 - 2. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - 3. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

- D. Qualification Data: For Installer.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Either a firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors" or a firm experienced in installing through-penetration firestop systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction of a minimum of five projects with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.

- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed in the UL "Fire Resistance Directory."

- D. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for

multicomponent materials.

- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, through-penetration firestop systems that may be incorporated into the Work include, but are not limited to, those systems indicated in the Through-Penetration Firestop System Schedule at the end of Part 3.
 1. Hilti, Inc.
 2. BioFireshield; RectorSeal Corporation.
 3. Specified Technologies, Inc. (STI).
 4. 3M; Fire Protection Products Division.
 5. Or approved equal.

2.2 FIRESTOPPING MATERIALS

- A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- B. Materials: Provide through-penetration firestop systems containing primary materials and fill materials which are part of the tested assemblies indicated in the Through-Penetration Firestop System Schedule at the end of Part 3. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only

components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated

2.3 MIXING

- A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

- A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Engage a qualified, independent inspecting agency to inspect through-penetration firestops. Independent inspecting agency shall comply with ASTM E 2174 requirements including those related to qualifications, conducting inspections, and preparing test reports.
- B. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.
- C. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued and firestop installations comply with requirements.

3.5 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

CONCRETE FLOORS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	F-RATING HR	HILTI	STI	3M	BIO-FIRE
CIRCULAR BLANK OPENINGS	1	FA 0006, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
		FA 0006, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278, FA 1017	C-AJ-1080, C-AJ-1240, F-A-1110	CAJ 1058	CAJ 1264
	2	CAJ 1226, CAJ 1278, FA 1017	C-AJ-1080, C-AJ-1240, F-A-1110	CAJ 1058	CAJ 1264
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, ENT)	1	CBJ 1034 CAJ 2109, CAJ 2168, FA 2054,	C-AJ-2297, F-A-2192, F-A-2210	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131

	2	CAJ 2109, CAJ 2168, FA 2054, FA 2067	C-AJ-2297, F-A-2192, F-A-2210	CAJ 2189, CAJ 2117	CAJ 2131
SINGLE OR BUNDLED CABLES	1	FA 3007, CAJ 3095,	C-AJ-3154, F-A-3021, F-A-3027	CAJ 3021	CAJ 3103
	2	FA 3007, CAJ 3095,	C-AJ-3154, F-A-3021, F-A-3037	CAJ 3021	CAJ 3103
CABLE TRAY	1	CAJ 4034, CAJ 4054, CAJ 4017	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
	2	CAJ 4034, CAJ 4054, CAJ 4017	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
TYPE OF PENETRANT SINGLE INSULATED PIPES	F-RATING HR 1	HILTI FA 5016, FA 5017, CAJ 5090, CAJ 5091,	STI C-AJ-5079, C-AJ-5087, F-A-5041	3M CAJ 5080, CAJ 5024, CAJ 5017	BIO-FIRE CAJ 5082
	2	FA 5016, FA 5017 CAJ 5090, CAJ 5091,	C-AJ-5079, C-AJ-5087, F-A-5041	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
	2	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046 CAJ 7051	C-AJ-7023, C-AJ-7027	CAJ 7003, CAJ 7021	CAJ 7036
	2	CAJ 7046 CAJ 7051	C-AJ-7023, C-AJ-7027	CAJ 7003, CAJ 7021	N/A
MIXED PENETRANTS	1	CAJ 8056, CAJ 8095, CAJ 8099	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	2	CAJ 8056, CAJ 8095, CAJ 8099	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
CONCRETE OR BLOCK WALLS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	F-RATING	HILTI	STI	3M	BIO-FIRE
CIRCULAR BLANK OPENINGS	1	CAJ 0055, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
	2	CAJ 0055, CAJ 0070	C-AJ-0094, C-AJ-0100	CAJ 0009	CAJ 0056
	3	CAJ 0055	C-AJ-0014	CAJ 0009	CAJ 0056
SINGLE METAL PIPES OR CONDUIT	1	CAJ 1226, CAJ 1278,	C-AJ-1080	CAJ 1058	CAJ 1264
	2	CAJ 1226, CAJ 1278,	C-AJ-1080	CAJ 1058	CAJ 1264
SINGLE NON- METALLIC PIPE OR CONDUIT (I.E. PVC,	1	CAJ 2109, WJ 2108, WJ 2121	W-J-2076, C- AJ-2297	CAJ 2189, CAJ 2117, CAJ 2027	CAJ 2131

CPVC, ABS, ENT)	2	CAJ 2109, WJ 2108, WJ 2121	W-J-2076, C- AJ-2297	CAJ 2189, CAJ 2117, CAJ 2027	CAJ2131
SINGLE OR BUNDLED CABLES	1	CAJ 3095, WJ 3060 WJ 3074	W-J-3090, W-J-3180	CAJ 3021	WJ 3071
	2	CAJ 3095, WJ 3060 WJ 3074	W-J-3090, W-J-3180	CAJ 3021	WJ 3071
CABLE TRAY	1	CAJ 4034, CAJ 4054, WJ 4016	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
	2	CAJ 4034, CAJ 4054, WJ 4016,	C-AJ-4029, C-AJ-4088	CAJ 4003	CAJ 4048
SINGLE INSULATED PIPES	1	CAJ 5090, CAJ 5091, WJ 5042	W-J-5005, W-J-5012	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
	2	CAJ 5090, CAJ 5091, WJ 5042	W-J-5005, W-J-5012	CAJ 5080, CAJ 5024, CAJ 5017	CAJ 5082
ELECTRICAL BUSWAY	1	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
	2	CAJ 6006, CAJ 6017	C-AJ-6003, C-AJ-6019	CAJ 6001, CAJ 6002	CAJ 6026
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	CAJ 7046, WJ 7029, WJ 7022	W-J-7089, W- J-7005, W-J- 7092	CAJ 7003, CAJ 7021	CAJ 7036
	2	CAJ 7046, WJ 7029, WJ 7022	W-J-7089, W-J-7005, W-J-7092	CAJ 7003, CAJ 7021	CAJ 7036
MIXED PENETRANTS	1	CAJ 8096, CAJ 8099 WJ 8007	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
	2	CAJ 8096, CAJ 8099 WJ 8007	C-AJ-8093, C-AJ-8113, C-AJ-8181	CAJ 8001, CAJ 8013	CAJ 8051
WOOD FLOORS		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	F-RATING	HILTI	STI	3M	BIO-FIRE
METAL PIPES OR CONDUIT	1	FC 1009, FC 1059	F-C-1074	FC 1002	FC 1031
	2	FC 1009, FC 1059	F-C-1074	FC 1002	FC 1031
NON-METALLIC PIPE OR CONDUIT	1	FC 2025, FC 2126	F-C-2032, F-C-2157	FC 2024	FC 2059
	2	FC 2025, FC 2126	F-C-2044, F-C-2020	FC 2024	FC 2059
SINGLE OR BUNDLED CABLES	1	FC 3012, FC 3044	F-C-3010	FC 3017	FC 3050
	2	FC 3012	F-C-3013	FC 3017	N/A
INSULATED PIPES	1	FC 5004, FC 5036, FC 5037	F-C-5043	FC 5014	FC 5025
	2	FC 5004	F-C-5043	N/A*	FC 5025

NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	FC 7013	F-C-7014, F-C-7023	FC 7001	
MIXED PENETRANTS	1	FC 8014, FC 8026	F-C-8036, F-C-8045, F-C-8029	FC 8013	N/A
	2	N/A*	F-C-8001	N/A*	N/A
GYPSUM WALLBOARD ASSEMBLIES		UL-CLASSIFIED SYSTEMS			
TYPE OF PENETRANT	F-RATING	HILTI	STI	3M	BIO-FIRE
METAL PIPES OR CONDUIT	1	WL 1054, WL 1164	W-L-1049	WL 1146	WL 1115
	2	WL 1054, WL 1164	W-L-1049	WL 1010, WL 1146	WL 1115
NON-METALLIC PIPE OR CONDUIT	1	WL 2078, WL 2075, WL 2128	W-L-2100, W-L-2048, W-L-2237	WL 2088, WL 2002	WL 2133
	2	WL 2078, WL 2075, WL 2128	W-L-2100, W-L-2048, W-L-2237	WL 2088, WL 2002	WL 2133
SINGLE OR BUNDLED CABLES	1	WL 3065	W-L-3210, W-L-3377	WL 3032, WL 3030	WL 3153
	2	WL 3065	W-L-3210, W-L-3377	WL 3032, WL 3030	WL 3153
CABLE TRAY	1	WL 4011, WL 4019	W-L-4043, W-L-4079	WL 4004	WL 4032
	2	WL 4011, WL 4019	W-L-4043, W-L-4079	WL 4004	WL 4032
INSULATED PIPES	1	WL 5029, WL 5096	W-L-5014, W-L-5054, W-L-5091	WL 5040, WL 5001, WL 5032	WL 5062
	2	WL 5029, WL 5096	W-L-5014, W-L-5054, W-L-5091	WL 5040, WL 5001, WL 5032	WL 5062
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1	WL 7040, WL 7042	W-L-7026, W-L-7149, W-L-7164	WL 7008	WL 7037
	2	WL 7040, WL 7042	W-L-7026, W-L-7149, W-L-7164	WL 7008, WL 7013, WL 7016	WL 7037
MIXED PENETRANTS	1	WL 8004, WL 8013	W-L-8050, W-L-8073	WL 8010	WL 8017
	2	WL 8004, WL 8013	W-L-8050, W-L-8073	WL 8010, WL 8002	WL 8017

* No UL-Classified system is available as of August 2003. Engineer Judgment Drawing Required.

NOTES:

1. Jobsite conditions of each through-penetration firestop system must meet all details of the UL- Classified System selected.
2. If jobsite conditions do not match any UL-classified systems in the schedules above, contact firestop manufacturer for alternative systems or Engineer Judgment Drawings.
3. Coordinate work with other trades to assure that penetration-opening sizes are appropriate for penetrant locations, and vice versa.
4. For 3-hour rated gypsum walls, contact the firestop manufacturer for a UL-classified system or engineer judgment drawing.

5. The Contractor shall verify that the schedule is current at the time of construction, and that each referenced system is suitable for the intended application.

END OF SECTION

SECTION 07 92 00: JOINT SEALANTS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Joint sealants and fillers.
- B. This Section includes joint sealants for the applications specified with the products in this Section and as indicated on Drawings.
- C. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- D. Items To Be Installed Only: Not Applicable.
- E. Items To Be Furnished Only: Not Applicable.
- F. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 088000 - GLAZING for glazing sealants.
 - 2. Section 092110 - GYPSUM BOARD ASSEMBLIES for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
 - 3. Section 095100 - ACOUSTICAL CEILINGS for sealing edge moldings at perimeters of acoustical ceilings.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

1.4 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. Qualification Data: For Installer.

- D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized Installer who is approved or licensed for installation of elastomeric sealants required for this Project.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer[or are below 40 deg F
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

- A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
 - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

- B. VOC Content of Interior Sealants: Provide interior sealants and sealant primers that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Colors of Exposed Joint Sealants: As determined by Architect.

2.2 JOINT SEALANTS

- A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- B. Stain-Test-Response Characteristics: Elastomeric sealants shall be nonstaining to porous substrates. Provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Latex Sealant: Comply with ASTM C 834, Type P, Grade NF.
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik Findley; Chem-Calk 600.
 - b. Pecora Corporation; AC-20+.
 - c. Sonneborn, BASF Building Systems; Sonolac.
 - d. Tremco Inc.; Tremflex 834.
 - e. May National Bondaflex Sil-A 700
 - 2. Extent of Use: Interior joints.

2.3 JOINT-SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F. Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include concrete, masonry and unglazed surfaces of ceramic tile.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following metal, glass, porcelain enamel and glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and

applications indicated, unless more stringent requirements apply.

- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 11 10: HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Standard hollow-metal steel frames.
 - 2. Fire-rated frames.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 087100 - DOOR HARDWARE for door hardware for steel doors.
 - 2. Section 081400 – FLUSH WOOD DOORS.
 - 3. Section 088000 - GLAZING for glazed lites.
 - 4. Section 099000 - PAINTING AND COATING for field painting steel doors and frames.
 - 5. Section 092110 – GYPSUM BOARD ASSEMBLIES.

1.3 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, temperature-rise ratings, and finishes for each type of steel door and frame specified.
- B. Shop Drawings:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.
 - 6. Details of anchorages, joints, field splices, and connections.
 - 7. Details of accessories.
 - 8. Details of moldings, removable stops, and glazing.
 - 9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

- D. Qualification Data: For Installer.
- E. Product Test Reports: Based on evaluation of comprehensive fire tests performed by a qualified testing agency, for each type of standard steel door and frame.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Source Limitations: Obtain standard steel doors and frames through one source from a single manufacturer.
- C. Fire-Rated Door, Sidelight and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 - 1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.
 - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Ceco Door Products; an ASSA ABLOY Group Company.
 - 3. CURRIES Company; an ASSA ABLOY Group Company.
 - 4. de LaFontaine

5. Mesker Door Inc.
6. Pioneer Industries, Inc.
7. Philipp Manufacturing Company.
8. Republic Builders Products Company.
9. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 metallic coating.
- D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Powder-actuated fasteners are not permitted on this project.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 - GLAZING.
- J. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD STEEL FRAMES

- A. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet, unless otherwise indicated to comply with exterior frame requirements.
 1. New Wall Construction: Fabricate frames with mitered or coped and knocked down corners.
 2. Existing Wall Construction: Fabricate frames with mitered or coped and knocked down corners.
 3. Frames for Level 2 Steel Doors: 0.053-inch-thick steel sheet.

- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 - 2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 - 3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick:
 - 1. Secured to wood floor system.

2.5 STOPS AND MOLDINGS

- A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.
- B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.
- C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.6 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.7 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- C. Hollow Metal Doors:
 - 1. Glazed Lites: Factory cut openings in doors.
- D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and not visible.
 - 2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams

- or joints, fabricated from same material as doorframe. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 6. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 1. Two anchors per jamb up to 60 inches high.
 2. Three anchors per jamb from 60 to 90 inches high.
 3. Four anchors per jamb from 90 to 120 inches high.
 4. Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 1. Three anchors per jamb up to 60 inches high.
 2. Four anchors per jamb from 60 to 90 inches high.
 3. Five anchors per jamb from 90 to 96 inches high.
 4. Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 5. Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 - c. Compression Type: Not less than two anchors in each jamb.
 - d. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 7. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers. b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 087100 - DOOR HARDWARE.
 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 - ELECTRICAL.
- G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow metal work.
5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.
 1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving

surfaces smooth and undamaged.

- a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
 6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Glazing: Comply with hollow metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer. Primer shall be compliant with low-emitting requirements as herein stated.
- D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION

SECTION 08 14 00: FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Solid-core doors with wood-veneer faces.
 - 2. Factory finishing for wood doors.
 - 3. Factory fitting flush wood doors to frames and factory machining for hardware.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 081110 - HOLLOW METAL DOORS AND FRAMES for frames for wood doors.
 - 2. Section 087100 - DOOR HARDWARE for hardware for wood doors.
 - 3. Section 088000 - GLAZING for glazing.

1.3 SUBMITTALS

- A. Product Data: For each type of door. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish specifications.
 - 5. Indicate fire ratings for fire doors.
- C. Samples for Verification:
 - 1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.
 - 2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI/AWMAC/WI's "Architectural Woodwork Standards."
 - 1. Provide AWI Quality Certification Program (QCP) labels or certificates indicating that doors comply with requirements of grades specified. Register the work under this Section with the AWI QCP.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84- inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 2. Warranty shall include hardware installation and replacement of glass and glazing.
 - 3. Warranty shall be in effect during the following period of time from date of Substantial Completion:
 - a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Flush Wood Doors:
 - a. Algoma Hardwoods Inc.
 - b. Eggers Industries; Architectural Door Division.
 - c. Lambton Doors.
 - d. Marshfield Door Systems.
 - e. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Doors for Transparent Finish:
 - 1. Grade: AWI Premium, with AWI Grade A faces.
 - 2. Species and Cut: Ash, plain sliced.
 - 3. Match between Veneer Leaves: Book match.
 - 4. Assembly of Veneer Leaves on Door Faces: Center balanced.
 - 5. Cross-Banding: 1/8 in. high density fiberboard with no added urea formaldehyde.
 - 6. Contractor to verify finish, species, cut, and veneer match in field; new doors to match existing.

2.3 SOLID-CORE DOORS

- A. Cores: Comply with the following requirements:
 - 1. Particle Core: ANSI A 208.1, Grade 1-LD-2.
 - 2. Provide doors with structural composite lumber cores instead of particleboard cores at locations where exit devices are indicated or where light or louver cutouts exceed 40% of the door area.
- B. Interior Veneer-Faced Doors:
 - 1. Construction: Five plies, hot-pressed, with stiles and rails bonded to core, then entire unit abrasive planed before veneering; 1-3/4 inch total thickness.
- C. Fire-Rated Doors:
 - 1. Fire Retardant Mineral Core, with no added urea formaldehyde cross-banding.
 - 2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as needed to eliminate through-bolting hardware.
 - 3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.

2.4 LOUVERS AND LIGHT FRAMES

- A. Wood Beads for Light Openings in Wood Doors:
 - 1. Wood Species: Same species as door faces.
 - 2. Profile: Manufacturer's standard shape.
 - 3. At 20-minute, fire-rated, wood-core doors, provide wood beads and metal glazing clips approved for such use.

2.5 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
 - 1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining. Drill pilot holes for screws for butt hinges and lock fronts at the factory.

2. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors to receive concealed vertical rod exit devices.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

- A. General: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated" for factory finishing.
- B. Finish doors at factory that are indicated to receive transparent finish. Factory prime and prepare for field finish doors indicated to receive opaque finish.
- C. Transparent Finish:
1. Grade: Premium.
 2. Finish: Manufacturer's standard catalyzed polyurethane finish with performance comparable to AWS System 11. Provide two finish coats.
 3. Staining: As selected by Architect from manufacturer's full range.
 4. Effect: Semifilled finish.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Section 087100 - DOOR HARDWARE.
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

3.3 ADJUSTING

- A. Operation: Rehang or replace doors that do not swing or operate freely.
- B. Protection: Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and reclean as necessary immediately before final acceptance.

- C. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Field-applied finish must comply with low-emitting requirements of LEED-S IEQ 4.2 as herein stated.

END OF SECTION

SECTION 08 71 00: DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes

- 1. Furnishing and installation of all mechanical and electrical finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

B. Related Sections

- 1. Division 6 Section - Finish Carpentry
- 2. Division 8 Section - Hollow Metal Doors and Frames
- 3. Division 8 Section - Wood Doors
- 4. Division 8 Section - Aluminum Framed Storefronts
- 5. Division 8 Section - Glass and Glazing

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere, unless specifically listed in the hardware sets:

- 1. Windows
- 2. Cabinets of all kinds, including open wall shelving and locks.
- 3. Signage, except as noted.
- 4. Complete toilet accessories including coat hooks, unless note otherwise.
- 5. Overhead doors, unless noted otherwise.

1.03 REFERENCES

A. Applicable state and local building codes and standards.

B. FIRE/LIFE SAFETY

- 1. NFPA - National Fire Protection Association
 - a. NFPA 70 – National Electric Code
 - b. NFPA 80 - Standard for Fire Doors and Fire Windows
 - c. NFPA 101 - Life Safety Code
 - d. NFPA 105 - Smoke and Draft Control Door Assemblies

C. UL - Underwriters Laboratories

- 1. UL 10C - Positive Pressure Test of Fire Door Assemblies
- 2. UL 1784 - Air Leakage Tests of Door Assemblies
- 3. UL 305 - Panic Hardware

D. Accessibility

1. ADA - Americans with Disabilities Act
 2. Massachusetts Architectural Access Board Regulation – 521 CMR
- E. DHI - Door and Hardware Institute
1. Sequence and Format for the Hardware Schedule
 2. Recommended Locations for Builders Hardware
- F. ANSI - American National Standards Institute
1. ANSI/BHMA A156.1 - A156.29, and ANSI A156.31 - Standards for Hardware and Specialties

1.04 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 requirements. Prior to submittal field verify existing doors and/or frames receiving new hardware and/or existing conditions receiving new openings. Verify new hardware is compatible with the existing door/frame preparation and/or existing conditions. Advise architect within the submittal package of incompatibility or issues.
- B. Catalog Cuts: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
- C. Final Hardware Schedule Content: Submit schedule with hardware sets in vertical format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, Include the following information:
1. Door Index; include door number, heading number, and Architects hardware set number.
 2. Opening Lock Function Spreadsheet; list locking device and function for each opening.
 3. Type, style, function, size, and finish of each hardware item.
 4. Name and manufacturer of each item.
 5. Fastenings and other pertinent information.
 6. Location of each hardware set cross-referenced to indications on Drawings.
 7. Explanation of all abbreviations, symbols, and codes contained in schedule.
 8. Mounting locations for hardware.
 9. Door and frame sizes and materials.
 10. Name and phone number for the local manufacturer's representative for each product.
- D. Key Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled. Utilize ANSI A156.28 "Recommended Practices for Keying Systems" as a guideline for nomenclature, definitions, and approach for selecting the optimal keying system.
- E. Samples: If requested by the Architect, submit production sample or sample installations as requested of each type of exposed hardware unit in the finish indicated, and tagged with a full description for coordination with the schedule.
1. Samples will be returned to the supplier in like-new condition. Units that are acceptable to the Architect may, after final check of operations, be incorporated into the Work, within limitations of key coordination requirements.
- F. Templates: After final approval of the hardware schedule, provide templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware.

- G. Riser and Wiring Diagrams: After final approval of the hardware schedule, submit riser and wiring diagrams as required for the proper installation of complete electrical, electromechanical, and electromagnetic products.
- H. Operations and Maintenance Data: Provide in accordance with Division 1 and include the following:
 - 1. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - 2. Catalog pages for each product.
 - 3. Name, address, and phone number of local representative for each manufacturer.
 - 4. Parts list for each product.
 - 5. Copy of final approved hardware schedule, edited to reflect "As installed."
 - 6. Copy of final keying schedule.
 - 7. One (1) complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.
 - 8. Copy of warranties including appropriate reference numbers for manufacturers to identify the project.
- I. Certificates of Compliance: Upon request of Architect or Authority Having Jurisdiction certificates of compliance for fire-rated hardware and installation instructions shall be made available.

1.05 QUALITY ASSURANCE

- A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Division 1 requirements. If proposing a substitute product, submit product data for the proposed item with product data for the specified item and indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability.
 - 1. Items specified as "no substitute" shall be provided exactly as listed.
 - 2. Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.
 - 3. If no other products are listed in a category, then "no substitute" is implied.
- B. Supplier Qualifications: A recognized architectural hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides a certified Architectural Hardware Consultant (AHC) available to the Owner, Architect, and Contractor, at reasonable times during the course of the Work for consultation.
- C. Single Source Responsibility: Obtain each type of hardware (latch and locksets, hinges, exit devices, closers, etc.) from a single manufacturer.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwrites Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- E. Electronic Security Hardware: When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and

technical data to the Architect and other related subcontractors. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Tag each item or package separately with identification related to the final hardware schedule, and include installation instructions with each item or package.
- B. Each article of hardware shall be individually packaged in manufacturer's original packaging.
- C. Contractor will provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Items damaged in shipment shall be replaced promptly and with proper material and paid for by whomever did the damage or caused the damage to occur.
- E. Hardware shall be handled in a manner to avoid damage, marring, or scratching. Irregularities that occur to the hardware after it has been delivered to the Project shall be corrected, replaced, or repaired by the Contractor. Hardware shall be protected against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. No direct shipments will be allowed unless approved by the Contractor.

1.07 WARRANTY

- A. Provide manufacturer's warranties as specified in Division 1 and as follows:
 - 1. Closers: 10 years.
 - 2. Locksets: 3 years.
 - 3. Other hardware: 1 year.
- B. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.
- C. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

1.08 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Awarding Authority has determined that certain products should be selected for their unique characteristics and particular project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute" (NO OTHER PRODUCTS WILL BE CONSIDERED FOR THOSE LISTED IN PROJECTS DOCUMENTS.)

- B. Approval of manufacturers other than those listed shall be in accordance with paragraph 1.05.A.
- C. Note that even though an acceptable substitute manufacturer may be listed, the product must provide all the functions and features of the specified product or it will not be approved.

Item	Scheduled Manufacturer	Acceptable Manufacturer
Hinges	Ives (IVE)	Hager, Stanley
Flush Bolts & Coordinators	Ives (IVE)	Burns, Rockwood
Locksets	Corbin-Russwin (C-R)	Compatible with Owner's Existing
Door Closers	LCN (LCN)	Sargent, Corbin-Russwin
Protection Plates	Ives (IVE)	Burns, Rockwood
Stops & Holders	Ives (IVE)	Burns, Rockwood
Thresholds & Weatherstrip	Reese (REE)	NGP, Zero
Silencers	Ives (IVE)	Burns, Rockwood
Lock Cores and Keying	Best (BES)	Compatible with Owner's Existing

- D. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
- E. Where the hardware specified is not adaptable to the finished shape or size of the members requiring hardware, furnish suitable types having the same operation and quality as the type specified, subject to the Architect's approval.

2.02 MATERIALS

- A. Fasteners
 - 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
 - 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.
 - 3. Provide concealed fasteners for hardware units that are exposed when door is closed except to the extent that no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless their use is the only means of reinforcing the work adequately to fasten the hardware securely. Review door specification and advise Architect if thru-bolts are required.
 - 4. Hardware shall be installed with the fasteners provided by the hardware manufacturer.
- B. Hinges
 - 1. Provide five-knuckle, ball bearing hinges of type, material, and height as outlined in the following guide for this specification:
 - a. 1-3/4 inch thick doors, up to and including 36 inches wide:
Interior: standard weight, steel, 4-1/2 inches high
 - 2. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
 - 3. Where new hinges are specified for existing doors and/or existing frames, the new hinge size must be identical to hinge preparation present in the existing door and/or existing frame.
 - 4. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins

- c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins
5. The width of hinges shall be 4-1/2 inches at 1-3/4 inch thick doors, and 5 inches at 2 inches or thicker doors. Adjust hinge width as required for door, frame, and/or wall conditions to allow proper degree of opening.
 6. Acceptable manufacturers and/or products: Ives 5BB series, Hager BB series, Stanley FBB Series.
- C. Flush Bolts
1. Provide automatic and manual flush bolts with forged bronze face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch steel or brass rods at doors up to 90 inches in height. Top rods at manual flush bolts for doors over 90 inches in height shall be increased by 6 inches for each additional 6 inches of door height. Provide dust-proof strikes at each bottom flush bolt.
 2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.
- D. Coordinators
1. Provide a bar-type coordinating device, surface applied to the underside of the stop at the frame head where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors.
 2. Provide a filler bar of the correct length for the unit to span the entire width of the opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required.
 3. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.
- E. Mortise Locks
1. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 2 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to 2.04 KEYING.
 2. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1 inch throw, constructed of stainless steel.
 3. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
 4. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.
 - a. Lever design shall be Corbin Russwin ASA (Armstrong).
 - b. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
 5. Acceptable manufacturers and/or products: Corbin Russwin ML2000 series. Any substitution made must be compatible with existing manufacturer.
- F. Door Closers
1. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.

2. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion journal shall be 11/16 inch diameter.
3. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
4. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
5. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within a 6-inch top rail without the use of a mounting plate so that closer shall not be visible through vision panel from pull side.
6. Closers shall not incorporate Pressure Relief Valve (PRV) technology.
7. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI).
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.
9. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
10. Door closers meeting this specification: LCN 4010/4110 series, Sargent 281/281P10 series factory assembled (without PRV), Corbin-Russwin DC6000 series. Any substitution made must be compatible with existing manufacturer.

G. Protection Plates

1. Provide kick plates, minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
 - a. Kick Plates – 10 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

H. Door Stops and Holders

1. Provide door stops for all doors in accordance with the following requirements:
 - a. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
 - b. Where wall stops cannot be used, provide dome type floor stops of the proper height.
 - c. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

I. Thresholds, Seals, Door Sweeps, Automatic Door Bottoms, and Gasketing

1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items as closely as possible.
2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
3. Acceptable manufacturers and/or products: Reese, National Guard, Zero.

J. Silencers

1. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.
2. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

2.03 FINISHES

A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:

1. Protection Plates: US32D (BHMA 630).
2. Door Closers: Powder Coat to Match.
3. Wall Stops: US32D (BHMA 630).

2.04 KEYING

A. Provide cylinder housings to accept permanent cores for the Owner's Existing Best key system conforming to the following requirements:

1. Provide construction cores with construction master keying for use during construction. The Owner or Owner's security agent shall install permanent keyed cores upon completion of the project. The temporary construction cores are to be returned to the hardware supplier.
2. Permanent cores shall be furnished and keyed by the Owner.
3. The hardware supplier, accompanied by a qualified factory representative for the manufacturer of the cores and cylinders, shall meet with Owner and Architect to review keying requirements and lock functions prior to ordering finish hardware.
4. Provide keys as follows
 - a. Three key blanks per lock and/or cylinder.
 - b. Two construction core control keys
 - c. Six construction master keys for each type (Contractor is to provide one set of construction keys to Architect)
5. Deliver all key blanks from the factory or authorized distributor directly to the Owner in sealed containers, return receipt requested. Failure to comply with these requirements may be cause to require replacement of all or any part of the keying system that was compromised at no additional cost to the Owner.
6. Approved products: Best. Any substitution made must be compatible with existing manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of finish hardware. Correct all defects prior to proceeding with installation.

3.02 INSTALLATION

A. Coordination:

1. Prior to installation of hardware, schedule and hold a meeting for the purpose of instructing installers on proper installation and adjustment of finish hardware. Representatives of locks, exit devices, closers, automatic operators, and electrified hardware shall conduct training; provide at least 10 days notice to representatives. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

- B. Hardware will be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question, as listed in the hardware schedule.
- C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- F. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- G. Operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.
- H. Existing Doors and/or Frames: Remove existing hardware being replaced, tag, and store according to contract documents. Field modify and prepare existing door and/or frame for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements, and fasteners for mounting new hardware and to cover existing door/frame preps.

3.03 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly.
- B. Where door hardware is installed more than one month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. Instruct Owner's personnel in the proper adjustment, lubrication, and maintenance of door hardware and hardware finishes.

3.04 FIELD QUALITY CONTROL

- A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of locks, exit devices, closer, and any electrified hardware, shall perform the following work:
 - 1. Examine and re-adjust each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
 - 2. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
 - 3. Replace hardware items that have deteriorated or failed due to faulty design, materials, or installation of hardware units.
 - 4. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.
 - 5. At completion of project, a qualified factory representative for the manufacturers of locksets, closer, exit devices, and access control products shall arrange and hold a training session to instruct

the Owner's personnel on the proper maintenance, adjustment, and/or operation of their respective products. After training a letter of compliance, indicating when the training was held and who was in attendance, shall be sent to the Architect.

3.05 PROTECTION

- A. Provide for the proper protection of complete items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

3.06 HARDWARE SCHEDULE

- A. Provide hardware for each door to comply with requirements of Section "Finish Hardware," hardware set numbers indicated in door schedule, and in the following schedule of hardware sets.
- B. It is intended that the following schedule includes complete items of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for a frame, door or fire codes, the preamble will be the deciding document.
- C. Locksets, exit devices, and other hardware items are referenced in the Hardware Sets for series, type, and function. Refer to the preamble for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets

Hardware Group No. 01 SINGLE WITH OFFICE LOCK

For use on mark/door #(s):

003 004 005 009 010 011

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	652	IVE
1	EA	OFFICE LOCK	ML2051 ASA CLS6	626	C-R
1	EA	LOCK CORE	PROVIDED BY OWNER		BES
1	EA	DOOR STOP	WS407CCV/F438 AS REQUIRED	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 02 SINGLE WITH CLASSROOM LOCK

For use on mark/door #(s):

006 007 014

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	652	IVE
1	EA	CLASSROOM LOCK	ML2055 ASA CLS6	626	C-R
1	EA	LOCK CORE	PROVIDED BY OWNER		BES
1	EA	DOOR STOP	WS407CCV/F438 AS REQUIRED	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 03 SINGLE WITH PASSAGE SET

For use on mark/door #(s):

002 008 012

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	652	IVE
1	EA	PASSAGE SET	ML2010 ASA	626	C-R
1	EA	DOOR STOP	WS407CCV/F438 AS REQUIRED	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 04 SINGLE WITH CLASSROOM LOCK X CLOSER X INSWING

For use on mark/door #(s):

001 016

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	652	IVE
1	EA	CLASSROOM LOCK	ML2055 ASA CLS6	626	C-R
1	EA	LOCK CORE	PROVIDED BY OWNER		BES
1	EA	SURFACE CLOSER	4011 REG	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	DOOR STOP	WS407CCV/F438 AS REQUIRED	626	IVE
1	SET	DOOR SEAL	798B	BLK	REE

Hardware Group No. 05 PAIR WITH CLASSROOM LOCK X CLOSER X AUTO FLUSHBOLTS

For use on mark/door #(s):

015

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 NRP SERIES AS SPECIFIED	652	IVE
1	SET	AUTO FLUSH BOLT	FB41P	630	IVE
1	EA	CLASSROOM LOCK	ML2055 ASA CLS6	626	C-R
1	EA	LOCK CORE	PROVIDED BY OWNER		BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	DOOR STOP	WS407CCV/F438 AS REQUIRED	626	IVE
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 06 SINGLE WITH ELECTRIFIED LOCK AND ALARM – 90 MIN RATED

For use on mark/door #(s):

013

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 SERIES AS SPECIFIED	652	IVE
1	EA	ALARM PANIC EXIT CONTROL LOCK	TBD	TBD	TBD
1	EA	SURFACE CLOSER	TBD	TBD	TBD
1	EA	ELECTRIFIED LOCKSET AND ASSOCIATED THAT OPERATES AS FOLLOWED*			

*The lock will be connected into the addressable fire alarm and will be secure except when in alarm mode or the power goes off.

END OF SECTION

SECTION 08 80 00: GLAZING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Glass and glazing for the following products and applications:
 - a. Steel doors, frames, sidelights, and borrowed lights, specified in Section 081110 - HOLLOW METAL DOORS AND FRAMES.
 - b. Wood doors specified in Section 081400 - FLUSH WOOD DOORS.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.

1.3 DEFINITIONS

- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.
- E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1.5 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: For the following products, in the form of 12-inch- square Samples for glass.
 - 1. Each type of laminated glass with colored interlayer.
 - 2. For each color (except black) of exposed glazing sealant indicated.
- C. Qualification Data: For installers.
- D. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance..
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, laminated glass and insulating glass.
- C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar- control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.
- D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

1.9 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to the Owner and signed by coated-glass manufacturer agreeing to replace coated- glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Ten years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to the Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
 1. Warranty Period: Ten years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

- A. Tempered Float Glass (Type T): ASTM C 1048; Type I (transparent flat glass); Quality-Q3; Kind FT; 1/4 inch thick unless indicated otherwise.

2.2 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Verify glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
 4. Adhesives and sealants that are used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Structural Glazing Adhesives: 100 g/L.
 - b. Architectural Sealants: 250 g/L.
- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:
 - a. Dow Corning Corporation; 790.
 - b. GE Silicones; SilPruf LM SCS2700.
 - c. Tremco Inc.; Spectrem 1.
- C. Glazing Sealants for Fire-Resistive Glazing Products: Identical to products used in test assemblies to obtain fire-protection rating.

2.3 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for project conditions.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both

surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.4 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Perimeter Insulation for Fire-Resistive Glazing: Identical to product used in test assembly to obtain fire-resistance rating.

2.5 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.
- C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing glazing, with Installer present, for compliance with the following:
 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 2. Minimum required face or edge clearances.
 3. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each glazing unit is installed.
- F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION

SECTION 09 21 10: GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Interior gypsum wallboard.
 - 2. Acoustic insulation in gypsum wallboard assemblies.
 - 3. Non-load-bearing steel framing.
 - 4. Installation of access panels.
 - 5. Marking and identification for fire- and smoke-partitions.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 055000 - METAL FABRICATION.
 - 2. Section 061600 - SHEATHING for sheathing at exterior assemblies.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide fire stop tracks capable of withstanding deflection within limits and under conditions indicated.
 - 1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
- B. Marking and Identification for Fire- and Smoke-Partitions: Fire walls, fire barriers, fire partitions, smoke barriers, smoke partitions and other walls required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:
 - 1. Be located in accessible concealed floor, floor-ceiling or attic spaces; and
 - 2. Be repeated at intervals not exceeding 30 feet measured horizontally along the wall or partition; and
 - 3. Include lettering not less than 0.5 inch in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," or other wording.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.5 QUALITY ASSURANCE

- A. Drywall Recycling: All new paper-faced gypsum wallboard scrap (cuts from construction but not demolition waste) shall be recycled by Gypsum Recycling America LLC or approved equal.
- B. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - b. Each texture finish indicated.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
 - 3. Simulate finished lighting conditions for review of mockups.
 - 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

- A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.0312 inch.
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in

- thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 1. Steel Network Inc. (The); VertiClip Series.
 2. Superior Metal Trim; Superior Flex Track System (SFT).
- C. Fire Stop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness compatible with studs and in width to accommodate depth of studs.
 1. Grace Construction Products; FlameSafe FlowTrak System.
 2. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
 3. Metal-Lite, Inc.; The System.
- D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: 0.0312 inch.
- E. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
- F. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
 1. Use of powder activated fasteners (PAF) is forbidden on this project.
- G. Isolation Strip at Exterior Walls: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 1. USG Corporation.
 2. Georgia-Pacific (G-P) Gypsum LLC.
 3. National Gypsum Company.
- B. Gypsum Wallboard (GWB): ASTM C 1396.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered.
 3. Location: Typical unless otherwise noted.
- C. Moisture- and Mold-Resistant Gypsum Board (MR GWB): ASTM C 1396. With moisture- and mold-resistant core and paper surfaces.
 1. Core: 5/8 inch, Type X where required.
 2. Long Edges: Tapered.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

4. Location: Toilet rooms, custodial room, and within 4 feet of any sink or plumbing fixture.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.
 - e. Curved-Edge Cornerbead: With notched or flexible flanges.
 - f. Other special shapes indicated on drawings.
- B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.
 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fry Reglet Corp.
 - b. Gordon, Inc.
 - c. Pittcon Industries.
 2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
 3. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Interior Gypsum Wallboard: Paper.
 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 1. Cementitious Backer Units: As recommended by backer unit manufacturer.
 2. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
 - 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2.7 IDENTIFICATION LABELS FOR FIRE- AND SMOKE-PARTITIONS

- A. Identification Labels: Vinyl adhesive signs, to comply with applicable local Code.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fire Wall Signs, Inc.
 - b. Safety Supply Warehouse.
 - 2. Text: "FIRE AND SMOKE BARRIER - PROTECT ALL OPENINGS"

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754. Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

- A. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- B. Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- C. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- D. Installation Tolerances: Install suspension systems that are level to within [1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on doorframes; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as for door

openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:
 - a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
 - b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

3.6 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces, except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

3.7 APPLYING INTERIOR GYPSUM BOARD

- A. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.

2. On partitions/walls, apply gypsum panels to minimize end joints.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- B. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance- rated assembly.
 2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
 3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
 4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners, unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. Curved-Edge Cornerbead: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings.

3.9 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 1. Level 1: Ceiling plenum areas and concealed areas not exposed to view.

2. Level 2: Panels that are substrate for tile.
 3. Level 4: Panel surfaces that will be exposed to view (typical panels).
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.10 INSTALLING IDENTIFICATION FOR FIRE- AND SMOKE-PARTITIONS

- A. Marking and Identification for Fire- and Smoke-Partitions: Permanently install as required by Code.

3.11 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, or exhibit mold growth. Repair of damaged panels in place is not acceptable.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION

SECTION 09 51 00: ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Acoustical ceiling tiles and panels.
 - 2. Suspension systems, grid systems and ceiling hangers.
 - 3. Acoustical Wall Panels
 - 4. Acoustical sealant at edge moldings at acoustical ceilings.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 092110 - GYPSUM BOARD ASSEMBLIES for gypsum board ceilings and soffits.
 - 2. Division 21 - FIRE PROTECTION for fire-suppression components located in ceilings.
 - 3. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING for air handling and distribution components located in ceilings.
 - 4. Division 26 - ELECTRICAL for light fixture and alarm system components located in ceilings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6 inch square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12 inch long Samples of each type, finish, and color.
- C. Asbestos Certification: Manufacturer's written certification that acoustical ceiling products contain no asbestos (0.0000%). Product labels indicating that it is the user's responsibility to test the products for asbestos are unacceptable and sufficient cause for rejection of the product on site.
- D. Maintenance Data: For finishes to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations:
 - 1. Acoustical Ceiling Panels: Obtain each type through one source from a single manufacturer.

2. Suspension Systems: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 1. Surface-Burning Characteristics: Provide acoustical panels complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Products: Subject to compliance with specified requirements, provide one of the following products for each type indicated.
- B. ACT-1: Standard Acoustical Ceiling Panel
 1. Manufacturer and Model Number:
 - a. Armstrong, fine fissured #1821, beveled tegular.
 - b. USG, equal product to above.
 - c. Celotex, equal product to above.
 2. Panel Size: 24 inches by 24 inches by 3/4 inch.
 3. Panel Mounting: Revealed edge at new construction, square edge at existing grid conditions.
 4. Noise Reduction Coefficient (NRC): Not less than 0.70.
 5. Ceiling Attenuation Class (CAC): Not less than 35.
 6. Grid Material: Painted steel.
 7. Grid Face Width: 15/16 inch.
 8. Color: White.
 9. Light Reflectance: 85 minimum

2.2 METAL SUSPENSION SYSTEMS

- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
 - 1. Manufacturer: USG, Armstrong, Celotex or Chicago Metallic.
 - 2. Structural Classification: Intermediate-duty system.
 - 3. End Condition of Cross Runners: Override (stepped) or butt-edge type.
 - 4. Face Design: Flat, flush.
 - 5. Cap Material: Steel or aluminum cold-rolled sheet.
 - 6. Color: White, prefinished.
 - 7. Grid Face Width: As specified with ACT type.

- B. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
 - 1. Anchors in Concrete: Anchors with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency; zinc-plated for Class SC1 service.
 - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - 1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106 diameter wire.

- D. Hold-Down Clips: At vestibules and areas subject to wind uplift, provide manufacturer's standard hold-down clips spaced 24 inches on all cross tees.

2.3 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
 - 1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 - 2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
 - 3. For narrow-face suspension systems, provide suspension system and manufacturer's standard edge moldings that match width and configuration of exposed runners.

- B. Suspension Trim: Subject to compliance with requirements, provide one of the following:
 - 1. Armstrong World Industries, Inc.; Axiom.
 - 2. BPB USA; Approved equal.
 - 3. USG Interiors, Inc.; Compasso

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 CEILING INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 - 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 - 6. Do not attach hangers to steel deck tabs.
 - 7. Space hangers not more than 48 o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 - 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 - 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 2. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09 65 10: RESILIENT FLOORING AND ACCESSORIES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Vinyl composite tile.
 - 2. Resilient wall base and accessories.
 - 3. Resilient stair accessories.
 - 4. Substrate preparation for resilient flooring and accessories.
- B. Alternates: Refer to the Drawings and Section 012300 - ALTERNATES for requirements.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 096820 – CARPET TILE for carpet accessories.
 - 2. Section 028213 – ASBESTOS ABATEMENT.
 - 3. Section 012200 – UNIT PRICES.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
 - 1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
 - 2. For Resilient Tile: Three (3) sets of full-size samples of each type and color.
- C. Maintenance Data: For resilient products to include in maintenance manuals.
- D. Warranty: Warranty documents.
- E. Replacement Material: At least 50 square feet of each type and color.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Installer to be certified for installation by manufacturer.

1.5 WARRANTY

- A. Manufacturer' Warranty: Submit manufacturer's standard warranty documents.
 - 1. Warranty Period: Five (5) years.
- B. The Flooring Contractor shall verify in writing to the Owner, a minimum of thirty (30) days prior to scheduled resilient flooring installation, the following substrate conditions:
 - 1. Moisture: Initial emission rate, as tested with a calcium chloride test kit, per ASTM F 1869-89 requirements.
 - 2. Alkalinity: Maximum pH of 10.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.7 PROJECT CONDITIONS

- A. Inspect and verify substrate conditions are acceptable for proper installation. Beginning of work acknowledges acceptance of substrate.
- B. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- C. After post installation period, maintain temperatures within rangerecommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- D. Close spaces to traffic during floor covering installation.
- E. Close spaces to traffic for 48 hours after floor covering installation.
- F. Install resilient products after other finishing operations, including painting, have been completed.

1.8 QUALITY ASSURANCE

- A. Manufacturer: Whenever possible, provide each type of resilient flooring as provided by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.
- B. Flooring Contractor Qualifications:
 - 1. The Awarded Contractor shall be an established firm, experienced in the installation of the specified product and shall have access to all manufacturer's required technical, maintenance, specifications, and related documents.
 - 2. The Flooring Contractor shall have completed at least three projects of similar magnitude, material and complexity, and must provide project reference details, including contact names and telephone numbers.
- C. Installer Qualifications: Installer experienced in performing work of this section who is specialized in installation of work similar to that required for this project.

1. Engage installer certified by manufacturer.
 2. Proof of Certification; provide proof of certification before start of work.
 3. Certified installer must be present on job site daily.
- D. Regulatory Requirements: Provide products with the following fire-test response characteristics as determined by testing identical products per test method indicated below by a testing and inspecting agency acceptable to authorities having jurisdiction.
- E. Standard of Quality: For the purpose of evaluating the quality of workmanship, a mock up installation of the specified floor covering shall be provided by the Flooring Contractor in an area designated by the Architect. Upon approval, this test installation shall then be considered the standard of quality and basis of comparison for the balance of the project. Areas found to be deficient by specification standards or application procedures, shall be repaired/replaced at Contractor's expense.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITE TILE

- A. ASTM F 2195.
- B. Manufacturers.
 1. Forbo Flooring Systems.
 2. Armstrong World Industries.
 3. Tarkett Group
- C. Basis of Design: Armstrong Excelon.
- D. Thickness: 1/10 inch (2.5 mm).
- E. Size: 12 by 12 inches (approximately).
- F. Colors and Patterns: 3 color patterns (25%, 25%, and 50%).

2.3 RESILIENT WALL BASE

- A. Wall Base: ASTM F 1861.
 1. Burke Mercer Flooring Products
 2. Johnsonite
 3. Marley Flexco (USA), Inc.
 4. Roppe Corporation
- B. Style and Colors: As indicated on the Drawings, colors as selected by the Architect.
- C. Type (Material Requirement): TV (vinyl, thermoplastic) as indicated on the Drawings.
- D. Shape: Straight (toeless) at carpet and coved at resilient flooring.
- E. Minimum Thickness: 0.125 inch.
- F. Height:
 1. Vinyl: 4 inches.

- G. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.
- H. Outside Corners: Premolded.
- I. Inside Corners: Premolded.
- J. Surface: Smooth.

2.4 RESILIENT MOLDING ACCESSORY

- A. Types Include the Following as Applicable: Carpet edge for glue-down applications, nosing for carpet, nosing for resilient floor covering, reducer strip for resilient floor covering, joiner for tile and carpet
 - 1. Burke Mercer Flooring Products
 - 2. Johnsonite
 - 3. Marley Flexco (USA), Inc
 - 4. Roppe Corporation
- B. Material: Vinyl.
- C. Profile and Dimensions: As indicated.

2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, Portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Linoleum Tile Adhesives: 50 g/L.
 - b. Cove Base Adhesives: 50 g/L.
 - c. Rubber Floor Adhesives: 60 g/L.
 - 2. Use polyurethane adhesives as recommended by manufacturer, equal to Forbo 660, in wet areas within 5' of water fountains, exterior doors, and floor drains.
- C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.
- D. Floor Finish: Provide protective liquid commercial grade acrylic floor finish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign

- deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 2. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
 3. Moisture Testing:
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.
- E. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
 1. Do not install resilient products until they are same temperature as space where they are to be installed.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

- A. Lay out tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles in pattern indicated.
- B. Match tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
- C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, doorframes, thresholds, and nosings.
- D. Extend tiles into toe spaces, door reveals, closets, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

- F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 RESILIENT WALL BASE INSTALLATION

- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Premolded Corners: Install premolded corners before installing straight pieces.

3.5 CLEANING AND PROTECTION

- A. Perform the following operations immediately after completing resilient product installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces with neutral cleaner (10.5 ph or less) to remove marks and soil.
 - a. Do not wash surfaces until after time period recommended by manufacturer.
- B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.
 - 1. Apply protective commercial grade acrylic matte-satin finish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes if recommended in writing by manufacturer.
 - a. Coordinate selection of floor finish with the Owner's maintenance service.
 - 2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
 - 3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION

SECTION 09 68 10: TILE CARPETING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Tile carpet for direct glue-down installation.
 - 2. Carpet accessories.
 - 3. Substrate preparation for carpet and accessories.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 096510 - RESILIENT FLOORING AND ACCESSORIES for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.
- B. Shop Drawings: Show the following:
 - 1. Carpet type, color, and dye lot.
 - 2. Type of subfloor.
 - 3. Type of installation.
 - 4. Pattern type, repeat size, location, direction, and starting point.
 - 5. Pile direction.
 - 6. Type, color, and location of edge, transition, and other accessory strips.
 - 7. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet: 3 full-size samples of each color.
 - 2. Exposed Edge Stripping and Accessory: 12-inch-long Samples.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

- E. Maintenance Data: For carpet to include in maintenance manuals specified in Division 01. Include the following:
 - 1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Dye Lots: All carpet shall have mergeable dye lots (same color manufactured at different times blending with no distinguishable differences).
- D. Mockups: Before installing carpet, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.7 WARRANTY

- A. General Warranty: Manufacturer's standard warranty covering face wear, delamination, color loss, and stain resistance. Period of warranty shall not be less than 15 year.

1.8 CARPET RECYCLING

- A. Modular manufacturer must meet the following criteria:
 - 1. Must have a closed loop "take back/recycling" program that allows for reclamation of each of the product types produced in manufacturing nylon face and backing.

1.9 EXTRA MATERIALS

- A. Provide full-size units equal to five (5) percent of amount installed for each type/color but not less than 10 tiles each.

PART 2 - PRODUCTS

2.1 CARPET

- A. Manufacturers: Provide products by one of the following:
 - 1. Interface
 - 2. Mannington Commercial.
 - 3. Lees Carpet by the Mohawk Group.
- B. Basis-of-Design: Interface Satori Series, 20" x 20" (approximate) modular tiles; 50 cm x 50 cm (actual).
- C. Colors and Patterns: Multi-color random patterns. To be determined by the Owner.
- D. Materials:
 - 1. Type 6, 6 nylon, 100% solution dyed.
 - 2. Construction: Tufled texture loop.
 - 3. Antimicrobial Treatment: AATCC 174, Part II > 95.0 % reduction.
 - 4. Fungicidal: AATCC 174, Part III, no growth.
 - 5. Soil/Stain Protection: AATC \geq 8.0 on the Red 40 stain, scale 175-1991.
 - 6. 18 oz.
 - 7. 1/12 gauge.
 - 8. GlasBacRE[®], Fiberglass reinforced.
 - 9. Minimum 40% recycled content.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the carpet manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by carpet manufacturer.
 - 1. VOC Limits: Provide adhesives with VOC content not more than 50g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.
- B. Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by

- performing bond and moisture tests recommended by the carpet manufacturer.
 - 2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
 - 3. Perform moisture and alkalinity tests, prior to installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.3, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Direct-Glue-Down Installation: Comply with CRI 104, Section 9, "Direct Glue-Down Installation."
- B. Comply with carpet manufacturer's written recommendations for non-directional method installation.
- C. Do not bridge building expansion joints with carpet.
- D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
- E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install in quarter turn pattern.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
 - 2. Remove yarns that protrude from carpet surface.
 - 3. Vacuum carpet using commercial machine with face-beater element.
- B. Protect installed carpet to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet against damage from construction operations and placement of equipment and

fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION

SECTION 09 90 00: PAINTING AND COATING

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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

1.2 DESCRIPTION OF WORK

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - 1. Field painting of exposed interior items and surfaces.
 - 2. Surface preparation for painting.
- B. Alternates: Refer to Drawings Section 012300 - ALTERNATES.
- C. Items To Be Installed Only: Not Applicable.
- D. Items To Be Furnished Only: Not Applicable.
- E. Related Work: The following items are not included in this Section and are specified under the designated Sections:
 - 1. Section 055000 - METAL FABRICATIONS.
 - 2. Section 061000 - CARPENTRY.
 - 3. Section 081110 - HOLLOW METAL DOORS AND FRAMES for factory priming steel doors and frames.
 - 4. Section 081400 - FLUSH WOOD DOORS for factory finishing.
 - 5. Section 092110 - GYPSUM BOARD ASSEMBLIES for surface preparation of gypsum board.

1.3 DEFINITIONS AND EXTENT

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 25 when measured at a 60-degree meter.
 - 3. Satin refers to low/medium-sheen finish with a gloss range between 25 and 35 when measured at a 60-degree meter.
 - 4. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 5. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.
- B. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- C. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not

to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
1. Prefinished items include the following factory-finished components:
 - a. Architectural woodwork, except standing and running trim.
 - b. Acoustical ceiling and wall panels.
 - c. Metal toilet enclosures.
 - d. Metal lockers.
 - e. Appliances.
 - f. Elevator entrance doors and frames.
 - g. Elevator equipment.
 - h. Finished mechanical and electrical equipment.
 - i. Light fixtures.
 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.
 - d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
 3. Finished metal surfaces include the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
 4. Operating parts include moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use

- representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
 - 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
 - 3. Submit two 8 inch by 12 inch Samples for each type of finish coating for Architect's review of color and texture only.
- C. Qualification Data: For Applicator.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
- C. Mockups: Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
 - 1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
 - a. Wall Surfaces: Provide samples on at least 100 sq. ft.
 - b. Small Areas and Items: Architect may designate items.
 - 2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
 - a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
 - 3. Final approval of colors will be from benchmark samples.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
 - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
 - 1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.7 PROJECT CONDITIONS

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work are listed in the Finish Schedule at the end of this Section.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
 - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
 - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
 - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
 - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen surface to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
 - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
 - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir continuously during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - 3. Use only thinners approved by paint manufacturer and only within recommended limits.

- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
 - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
 - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 - 3. Provide finish coats that are compatible with primers used.
 - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convactor covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, to maintain system integrity and provide desired protection.
 - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 - 8. Finish exterior doors and doors in wet areas on tops, bottoms, and side edges the same as exterior faces.
 - 9. Sand lightly between each succeeding enamel or varnish coat.

- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
 - 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 - 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 - 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
 - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

- F. Mechanical items to be painted include, but are not limited to, the following:
 - 1. Uninsulated metal piping.
 - 2. Uninsulated plastic piping.
 - 3. Pipe hangers and supports.
 - 4. Tanks that do not have factory-applied final finishes.
 - 5. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
 - 6. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
 - 7. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

- G. Electrical items to be painted include, but are not limited to, the following:
 - 1. Switchgear.
 - 2. Panelboards.
 - 3. Electrical equipment that is indicated to have a factory-primed finish for field painting.

- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.

- L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
 - 1. The Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
 - 2. The Architect may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
 - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 PAINT SCHEDULE

- A. Schedule: Provide products and number of coats specified. Use of manufacturer's proprietary product names to designate colors, materials, generic class, standard of quality and performance criteria and is not intended to imply that products named are required to be used to the exclusion of equivalent performing products of other manufacturers.
- B. Interior Paint Schedule:
 - 1. Interior Gypsum Wallboard for Latex Satin Finish:
 - One Coat
 - 1. Moore Ecospec Interior Latex Primer Sealer (231)
 - 2. Duron Genesis Latex Primer
 - 3. S-W Harmony Latex Wall Primer
 - 4. PPG Pure Performance Latex Primer
 - And Two Coats
 - 1. Moore Pristine Ecospec Interior Latex Satin-Gloss (224)
 - 2. Duron Genesis Latex Satin-Gloss
 - 3. S-W Harmony Latex Satin-Gloss
 - 4. PPG Pure Performance Latex Satin-Gloss

2. Interior Exposed Steel, Joists, Ductwork, Conduit and Similar Items (where indicated):
 - One Coat
 1. Tnemec 115 WB Unibond or 15 Unibond at 2.5 to 3.0 mils DFT
 2. PPG PMC Amercoat 220 Acrylic at 3.0 mils DFT
 3. International Intercryl 530 at 2.5 to 3.0 mils DFT

3. Interior Ferrous Metals (door frames, etc.):
 - Factory Primed
 1. Moore C235 Impervo Alkyd Enamel
 - Add One Coat
 1. PPG 6-90 XI SPEEDHIDE Alkyd Enamel
 2. Sherwin Williams Pro Classic interior Alkyd Enamel
 - Add One Coat
 1. Moore C235 Impervo Alkyd Enamel
 2. PPG 6-90 XI SPEEDHIDE Alkyd Enamel
 3. Sherwin Williams Pro Classic interior Alkyd Enamel

4. Interior Finish Woodwork for Opaque Finish:
 - One Coat
 1. Sand 120 grit sandpaper
 1. Sand 220 grit sandpaper
 1. Moore 785 Super Spec Acrylic Primer
 2. PPG 6-2 SPEEDHIDE Primer
 3. Sherwin Williams Quick dry interior/exterior stain blocking primer
 - Add One Coat
 1. Moore 785 Super Spec Acrylic Latex Enamel
 2. PPG SPEEDHIDE Latex Enamel
 3. Sherwin Williams Pro Classic interior Alkyd Enamel
 - Add One Coat
 1. Moore 785 Super Spec Acrylic Latex Enamel
 2. PPG SPEEDHIDE Latex Enamel
 3. Sherwin Williams Pro-Mar 400

5. Mechanical and Electrical Work: Paint all exposed items throughout the project except factory finished items with factory-applied baked enamel finishes which occur in mechanical rooms or other areas, and excepting chrome or nickel plating, stainless steel, and aluminum other than mill finished. Paint all exposed ductwork and inner portion of all ductwork: Same as specified for other interior metals, hereinabove.

END OF SECTION

SECTION 21 13 13: FIRE SUPPRESSION

PART 1 – GENERAL

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END OF INDEX

SECTION 21 13 13: FIRE SUPPRESSION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. All the Contract Documents and General Provisions of the Contract including, but not limited to, General and Supplementary Conditions, and Division 01 Specification Sections apply to this Section.
- B. The work of this section provides and contains general information which is inherently made a part of each section and applies to all work performed under this contract.
- C. The Drawings on which this Contract is based are listed in Section 00 01 15. Consult all Drawings, note all conditions that may affect the work and care for same in executing the contract.
- D. Refer to Section 01 23 00, Alternates, for alternates which may affect the work of this section.

1.2 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, services and accessories necessary to Design, Furnish and Install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein. The Design shall conform to the documents and shall be subject to approval by the Architect.
- B. Without limiting the generality thereof, the work to be performed under this Section includes:
 - 1. A hydraulically designed automatic sprinkler system to provide 100% protection for the renovated area of the existing building as noted on the Drawings. Prepare Working Drawings for approval of the Architect, the local authority having jurisdiction, and the owner's insurance company under stamp of an independent Massachusetts Registered Professional Fire Protection Engineer.
 - 2. Pipe and Fittings
 - 3. Valves
 - 4. Hangers
 - 5. Sprinkler Heads
 - 6. Systems Identification
 - 7. Flushing and Testing of the interior system as provided herein.
 - 8. Drilling, Coring, Cutting and Patching of holes and openings for Fire Suppression Piping and Equipment in accordance with Section 01 73 29. All such holes require sleeves.
 - 9. Scaffolding, Rigging, and Staging required for all Fire Suppression Work. Comply with Division 01 requirements.
 - 10. Provide Seismic Restraints for all Fire Suppression Systems conforming to the requirements of Section 23 05 48 which Section is herein incorporated by reference as work of the Fire Suppression Sub Contractor. Seismic Restraints are required on new piping in existing building.
 - 11. The work is to be phased. The Fire Suppression Subcontractor shall construct the Project in phases as directed by the Architect to suit the Project progress schedule, as well as the completion date of the Project. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural Drawings. Maintain the Fire Suppression Systems in the various phases as they are occupied by the owner, and for the life of the Project. Every space of the renovated area in the existing building when occupied shall have a fully functional sprinkler system.
 - 12. Demolition of existing fire piping and heads in affected work areas and performed in a manner to preserve the phasing schedule.

13. Smoke and Firestopping Seals and sealing of all wall penetrations as detailed on the drawings. Refer to 07 84 10 – Penetration Firestopping, which defines the firestopping materials and methods.
14. When open-flame or spark producing tools such as blower torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch through the Local Fire Department where work is being performed and until it is completed.
15. Sprinkler contractor is to protect and maintain existing sprinkler heads and piping system to remain. All leaks that develop in the existing piping upon completion of work are to be repaired at no additional cost to owner.
16. Hydrant flow test.

1.3 RELATED WORK

- A. The following items of work related to the Fire Suppression Work are included under other Sections of the Specifications:
 1. Cutting and Patching beyond 1.3B.9 above: SECTION 01 73 29 - CUTTING AND PATCHING.
 2. Finish Painting: SECTION 09 90 00 – PAINTING.
 3. Temporary Facilities: SECTION 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

1.4 CODES, ORDINANCES, AND PERMITS

- A. Perform all work in accordance with the following Codes:
 1. 780 CMR: The State Building Code.
 2. 527 CMR: The Fire Prevention Regulations.
 3. NFPA-13-2007, NFPA-14-2007, and Owner's insurance company requirements.
 4. All applicable Local, State, and Federal Codes, Statutes, or Regulations.
 5. Town of Arlington Fire Department.
 6. Town of Arlington Building Department.
- B. Obtain all permits, inspections, and approvals, from the governing authorities and pay all fees and include cost in the bid, including approvals for the cross connection control device. Provide the Owner with the cross connection permit for the device in the Owner's name.

1.5 RECORD DRAWINGS

- A. General: Refer to DIVISION 01 - GENERAL REQUIREMENTS for general requirements for maintaining as-built drawings and submitting final reproducible record documents.
- B. The General Contractor will provide two sets of black or blue line on white Drawings to the Fire Suppression Subcontractor, one set of which shall be maintained at the site and which shall, at all times, be accurate, clear, and complete, showing the actual locations of all equipment and piping as it is being installed. The Record Drawings shall be available to the Architect/Engineer's field representative at all times.
- C. Provide electronic AutoCAD drawings to indicate revisions to piping size and location both exterior and interior; including locations of valves and other equipment requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.

- D. Include in the Record Drawings any addenda, sketches, and supplementary Drawings issued during the course of construction.
- E. Non-availability of Record Drawings or inaccuracies therein will postpone the final inspection until they are available.
- F. All valves shown on these Drawings shall be numbered with numbers corresponding to those on the valve charts.
- G. All costs related to the foregoing requirements shall be paid by the Fire Suppression Subcontractor.

1.6 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. Provide operating instructions to the owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed. At the completion of the project, turn over to the Architect four (4) complete manuals in three-ring, loose-leaf binders, containing the following:
 - 1. Complete Shop Drawings of all equipment.
 - 2. Operation description of all systems.
 - 3. Names, addresses, and telephone numbers of all suppliers of the system.
 - 4. Preventive maintenance instructions for all systems.
 - 5. Spare parts list of all system components.

1.7 SHOP DRAWINGS AND MATERIAL SCHEDULES

- A. Refer to 01 33 00 – SUBMITTAL PROCEDURES for substitution of equipment and submittal of Shop Drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in or additional connections, piping, supports or construction, same shall be provided as the responsibility, and at the expense, of the Fire Suppression Subcontractor.
- B. Fabrication of any material or performing of any work prior to the final approval of the Submittals will be entirely at the risk of the Subcontractor. The Subcontractor is responsible for furnishing and installing materials called for in the Contract Documents, even though these materials may have been omitted from approved Submittals.
- C. Submit Shop Drawings for the following materials and equipment.
 - 1. Coordinated Working Drawings including size, type, length, temperature rating of sprinkler heads, piping and the like. Indicate flow test results, design criteria, diffuser and light locations.
 - 2. Sprinkler Heads
 - 3. Hangers and Seismic Restraints
 - 4. Pipe, Fittings, and Appurtenances
 - 5. Systems Identification
 - 6. Valves

1.8 COORDINATION DRAWINGS

- A. Before materials are purchased or Work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces.

- B. Coordination Drawings are for the Contractor's and the Architect's use during Construction and shall not be construed as replacing any Shop or Record Drawings required elsewhere in these Contract Documents.
- C. Detailed procedures for Coordination Drawings are contained in DIVISION 01 of these Contract Documents.

1.9 GUARANTEE

- A. Guarantee all work under this Section free from defects in workmanship or materials for a period of one (1) year from the date of final acceptance of the building, as set forth in the Contract.
- B. Replace any such defective work developing during this period, unless such defects are clearly the result of bad usage of equipment by others. Where such defective work results in damage to work of other Sections of the Specifications, restore such work to its original condition by mechanics skilled in the affected trade.

1.10 DRAWINGS

- A. All work shown on the Drawings is intended to be approximately correct to scale but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting. To carry out the true intent and purpose of the plans, furnish all necessary parts to make a complete working system ready for use.
- B. The Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- C. Refer to the Architectural, Structural, and Other Mechanical and Electrical Drawings which indicate the construction in which this work shall be installed. Locations shown on the plans shall be checked against the general and detailed drawings of the construction proper. All measurements must be taken at the building.

1.11 SYSTEM DESCRIPTION

- A. The existing building and the new renovation areas are to be 100% sprinklered with an automatic sprinkler system. The system shall be designed in accordance with NFPA-13-2007.
- B. All indicated room areas are to be 100% sprinklered including all closets regardless of size.
- C. Locations of sprinkler heads are shown in some of the areas to be sprinklered only to establish the patterns and design intent. Major equipment and runs of piping may also be shown.
- D. The documents require that the affected areas of the building be covered 100%. This includes all closets, combustible concealed spaces, and other areas as required under NFPA-13-2007. These areas are to be included in the Sub-contractor's bid whether or not the heads are shown on the sprinkler plans.

1.12 ALARM FACILITIES

- A. Existing to remain.

1.13 PIPE MARKER IDENTIFICATION SYSTEM

- A. Mark all fire mains installed under this Section with a marking system in basic colors conforming to those specified in ANSI/ASME A-13.1. Markings shall indicate pipe content and direction of flow. Apply markers every 20 feet on center on piping which is exposed in mechanical or storage areas and above suspended accessible ceilings. Also, apply at all valves, tee joints, alarms, and/or controls.
- B. Adhesive system may be used throughout except at the mechanical rooms in which case markings shall be painted on.

1.14 IDENTIFICATION SIGNS

- A. All equipment and systems shall be identified with signs furnished and attached in accordance with NFPA 13.

1.15 BREAKDOWN

- A. Submit a breakdown of the contract price to aid the Architect in determining the value of the work installed as the job progresses.
- B. No requisition will be approved until the breakdown is delivered to the Architect.

1.16 VISIT TO SITE

- A. Prior to submitting a bid, visit the site of work and become familiar with existing conditions at the site of the work. Any assumptions made are at this Subcontractor's expense.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All materials and equipment furnished under this Section shall be new, unused, first quality of a manufacturer of established reputation and shall be U.L./F.M. approved. Each valve, fitting, section of pipe, piece of equipment, etc., shall have cast or indelibly stamped thereon the manufacturer's name, pressure rating where applicable, type, etc.

2.2 PIPE AND FITTINGS

- A. Pipe and fittings shall conform to the latest A.S.A., A.S.T.M., C.A., and F.S. Standards. All grooved products shall be of one manufacturer to conform to NFPA Standards.
- B. All piping installed under this Section shall be in accordance with the following:

<u>Service</u>	<u>Materials</u>
Sprinkler piping valves, sprinkler piping 1-1/2 inch and smaller	ASTM A-53, Schedule 40 steel pipe, black for wet system,
Sprinkler piping 2 inch to 6 inch	Schedule 10, ASTM A-135 U.L./F.M. steel by Allied, or equal, black for wet system

- C. Fittings on fire line piping, 2 inch and larger, shall be Victaulic Fire Lock Ductile Iron Fittings conforming to ASTM A-536 with integral grooved shoulder and back stop lugs and grooved ends for use with Style 009-EZ or Style 005 couplings.
- D. Branch line fittings shall be welded or shall be Victaulic 920/920N Mechanical Tees.
- E. Schedule 10 pipe shall be roll grooved. Schedule 40 pipe where used with mechanical couplings shall be rolled groove and shall be threaded where used with screwed fittings.
- F. Fittings for threaded piping shall be malleable iron screwed sprinkler fittings.
- G. All pipe and fittings shall be U.L./F.M. approved for sprinkler service. All pipe and fittings shall be black steel for wet system.
- H. Grooved fittings shall be manufactured by Victaulic, Grinnell, Anvil, or equal.

2.3 JOINTS

- A. Threaded pipe joints shall have an approved thread compound applied on male threads only. Teflon tape shall be used for threads on sprinkler heads.
- B. Joints on piping, 2 inch and larger, shall be made up with Victaulic, or equal, Fire Lock Style 005, rigid coupling of ductile iron and pressure responsive gasket system for wet sprinkler system as recommended by manufacturer. Cutting, roll grooving, lubrication, and assembly of all joints shall be made strictly in accordance with manufacturer's recommendations. Exercise particular caution in the use of lubricant to avoid "squeeze out" of lubricant when system is in service.
- C. Grooved joints shall be manufactured by Victaulic, Grinnell, Anvil, or equal.

2.4 VALVES

- A. Drains shall be provided in the systems as may be required by field conditions. Provide drains at all low points and wherever necessary to insure that all portions of the sprinkler piping may be completely drained. Test connections shall be provided as required to test all portions of the system. Pipe low point drains and test connections to suitable receptor as determined in field or shown on Drawings.

2.5 SPRINKLERS

- A. All sprinklers to be used on this project shall be Quick Response type and shall be stamped with date of manufacture and temperature rating. Temperature ratings shall be determined by the location of the heads and shall be 155 degrees F. throughout except in special areas around heat producing equipment in which case use temperature rating to conform with hazard as specified in NFPA 13-2007. Orifice diameter and K factor shall be appropriate to meet the hydraulic design criteria, the available water supply, and NFPA Standards.
- B. Furnish spare heads of each type installed located in a cabinet along with special sprinkler wrenches. The number of spares, location of cabinet, etc., shall be in complete accord with NFPA 13-2007.
- C. Sprinklers shall be manufactured by Tyco, Victaulic, Viking, or equal.

- D. Upright sprinkler heads in areas with no ceilings shall be Tyco Model "TY-FRB" Quick Response, upright natural brass finish heads. Include heavy duty sprinkler guards in all mechanical and storage rooms, gymnasium outdoor activity, aerobics, wrestling, auto shops and general shop. In pool area, all heads shall have a corrosive resistant lead coating.
- E. Sidewall heads shall be Tyco Model "TY-FRB" Quick Response with white polyester head and escutcheon.
- F. Pendent wet sprinkler heads shall be Tyco Model "TY-FRB" Quick Response recessed adjustable escutcheon, white polyester finish.
- G. Concealed heads shall be Tyco Model "RFII" Quick Response concealed type, 1-1/2 inch adjustment white cover plate. In special areas, as may be noted on the Drawings, provide alternate cover plate finishes.

2.6 SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS

- A. Furnish and install All Supplementary Steel, Channels, and Supports required for the proper installation, mounting, and support of all equipment.
- B. Supplementary Steel and Channels shall be firmly connected to building construction in a manner approved by the Architect.
- C. The type and size of the Supporting Channels and Supplementary Steel shall be determined by the Fire Suppression Subcontractor and shall be sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.
- D. All Supplementary Steel and Channel shall be installed in a neat and workmanlike manner parallel to the walls, floor, and ceiling construction. All turns shall be made with 90 degree fittings, as required to suit the construction and installation conditions.

2.7 HANGERS AND SEISMIC RESTRAINTS

- A. Hangers shall be furnished, installed, and supported from the building structure in accordance with NFPA - 13, Section 23 05 48 and Drawing VS-1.
- B. All new piping in the existing building shall be seismic restrained.

2.8 ALARM DEVICES

- A. Existing to remain.

PART 3 - EXECUTION

3.1 WORKMANSHIP AND INSTALLATION METHODS

- A. All work shall be installed in a first-class manner consistent with the best current trade practices. All materials shall be securely installed plumb and/or level.
- B. Protect all concealed heads. Coordinate and advise finishing trades so as to prevent painting of sprinkler heads or inadvertent filling with paint or jointing compound of required air spaces in the case of the concealed type sprinkler heads.

3.2 WORK COORDINATION AND JOB OPERATIONS

- A. The equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same.
- B. Before materials are purchased or work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces.
- C. Coordination Drawings are for the Contractor's and the Architect's use during construction and shall not be construed as replacing any Shop or Record Drawings required elsewhere in these Contract Documents.
- D. Detailed procedures for Coordination Drawings are contained in DIVISION 01 - GENERAL REQUIREMENTS of these Contract Documents.
- E. Particular attention shall be directed to the coordination of piping and other equipment installed in the ceiling areas. Coordinate the elevations of all piping in hung ceiling areas to insure adequate space for the installation of recessed lighting fixtures before other mechanical equipment is installed.
- F. Furnish to the General Contractor, and all other Subcontractors, all information relative to the portion of the Fire Suppression installation that will affect them, sufficiently in advance so that they may plan their work and installation accordingly.
- G. In case of failure to give proper information as indicated above, sufficiently in advance, pay for all back-charges for the modification, renovation, and relocation of any portion of the work already performed.
- H. Obtain from the other trades, all information relative to the Fire Suppression Work to be executed in conjunction with the installation of their respective equipment.

3.3 CUTTING AND CORE DRILLING

- A. Perform all cutting and core drilling operations that are outlined in Part 1 of this SECTION. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the walls, overhead structure, and other structural components is maintained until permanent work is installed. Prior to any coring or cutting, verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved Coordination Drawings.
- B. Cut all masonry and concrete with an approved diamond blade concrete saw in a neat straight direction, perpendicular to the plane of the wall or floor.
- C. Use a core drilling process which produces clean, sharp edges and the minimum hole size which will accommodate the size of pipe sleeve specified.
- D. Patch all holes up to the sizes indicated in Section with material and methods as are specified in the Section of the Specifications for the finish trade involved. Holes which are improperly done due to poor materials or method, shall be patched to the satisfaction of the Architect by the finish trade and back-charged to this Subcontractor.

3.4 CLEANING AND PROTECTION

- A. Protect all materials and equipment during shipment and installation and properly handle and store at the job site so as to prevent damage. Assume full responsibility for protection of work until its completion and final acceptance.
- B. Keep the premises reasonable clean at all times and remove rubbish caused by the Fire Suppression work as directed by the Architect.
- C. Upon completion of this work, clean all sprinklers, and equipment and replace damaged parts. Failure to fulfill this obligation will result in back-charges for correction of the defective work by others.
- D. Sprinkler contractor is to protect and maintain existing sprinkler heads and piping system to remain. All leaks that develop in the existing piping upon completion of work are to be repaired at no additional cost to owner.

3.5 SLEEVES, INSERTS, AND ESCUTCHEONS

- A. All piping passing through walls, and partitions shall be sleeved and all such sleeves shall be furnished and installed by the Fire Suppression Subcontractor as detailed on the Drawings and herein specified. Fire Suppression Contractor, shall do his core drilling as approved by the Architect and the cored opening shall have a sleeve caulked and leaded in place.
- B. All pipes passing through floor, whether slab-on grade or above grade levels shall be sleeved with sleeve extending 1 inch above floor. This includes all piping in stairwells, closets, partitions, etc.
- C. All sleeves shall be Schedule 40 galvanized steel pipe and shall be reamed. There shall be annular space between the sleeve and pipe per NFPA requirements. Sleeves on drywall, masonry, or concrete walls and partitions shall be flush with wall on both sides.
- D. The space between sleeve and pipe, in all cases, shall be filled with U.L./F.M. approved caulking compound. This includes pipes concealed in chases and/or partitions.
- E. Inserts, where required, shall be furnished and set by the Fire Suppression Subcontractor and, where necessary, may be drilled or power driven and shall be sized such that the insert will not exceed a depth of penetration of 1 inch into concrete.
- F. Escutcheons: All exposed pipe, uncovered, passing through walls, or floors, or ceilings, shall be fitted with C.P. brass spun or split type escutcheons with approved clamping device for holding in position. Floor escutcheons shall be deep enough to fit over sleeves, fastened to pipe, and extend down to floor.

3.6 TESTING

- A. Flush the system and test all work in the presence of the Architect and/or Engineer and as required by NFPA and the Insurance Company. The flushing and testing procedures to be followed are specified herein. At the completion of the testing, submit fully executed copies of Contractor's Material and Test Certificate for above ground piping as contained in NFPA-13.
 - 1. Sprinkler System:
 - a. Hydrostatic Testing: The interior system shall be hydrostatically tested at 200 psi for 2 hours in accordance with NFPA 13 paragraph 24.2.1.

- b. Operational Testing: Water flow switches and associated alarm systems shall be tested by water flow through the inspectors test assemblies in accordance with NFPA 13, 24.2.3.
- c. Main Drain Test: A flow test shall be performed on the main drain valve and recorded on the Contractor's test certificate in conformance with NFPA 13, 24.2.3.4.

END OF SECTION

SECTION 23 00 00: HVAC
(Filed Sub-Bid Required)

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END OF INDEX

SECTION 23 00 00: HVAC
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 FILING SUB-BIDS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Time, Manner and Requirements for Submitting Sub-Bids:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the _____ at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

PROJECT: (Insert project number from top of page)

SUB-BID FOR SECTION: 23 00 00 – HVAC

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the _____ as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the _____, or may be obtained by written or telephone request; telephone _____.
3. Sub-bids filed with the _____ shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the _____ in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

C. Sub Sub-Bid Requirements:

CLASS OF WORK:	REFERENCE ARTICLE:
Insulation	2.6, 3.5
Sheetmetal & Accessories	2.5, 2.17, 2.18, 2.19, 2.20, 2.21, 2.22, 3.4, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21
Automatic Temperature Control	2.32, 3.31
Air & Water Balancing	3.32

Reference to Drawings: Work to be performed under this Section is shown on Drawings numbered:

- M0.1 HVAC LEGEND, SCHEDULES AND GENERAL NOTES
- MD1.1 HVAC 6TH FLOOR EXISTING CODITIONS AND DEMOLITION PLANS
- M1.1 HVAC 6TH FLOOR DUCTWORK VENTILATION LAYOUT
- M1.2 HVAC 6TH FLOOR VARIABLE REFRIGERANT FLOW AND PIPING LAYOUT
- M1.3 HVAC ROOF PLAN
- M2.1 HVAC DETAILS
- M3.1 HVAC CONTROLS DIAGRAMS
- M3.2 HVAC VRF SYSTEM SCHEMATIC DCU LAYOUT
- VS-1 VIBRATION AND SEISMIC
- VS-2 VIBRATION AND SEISMIC

1.2 RELATED DOCUMENTS

- A. All of the Contract Documents, including Drawings, General and Supplementary Conditions and Division 1 - General Requirements, apply to the Work of this Section.
- B. Carefully examine all of the Contract Documents for requirements which affect the Work of this Section. The exact scope of Work of this Section cannot be determined without a thorough review of all specification Sections and other Contract Documents.

1.3 WORK TO BE PERFORMED

- A. The work described herein shall be interpreted as work to be done by the HVAC Subcontractor. Work to be performed by other trades will always be specifically referenced to that trade.
- B. Furnish all staging, rigging, temporary support, labor, materials, and perform all operations in connection with the installation of the HVAC work.
- C. Without limiting the generality thereof, the work to be performed under this Section includes complete modifications HVAC systems with the following major sub systems:
 - 1. Ductwork, Diffusers, Registers And Grilles
 - 2. Rooftop Units
 - 3. Ductless Cooling Unit Systems
 - 4. Direct digital automatic temperature controls
- D. Refer to Section 23 05 48 "Vibration Control and Seismic Restraint" for additional work to be provided under this Section 23 00 00.
- E. Refer to Section 07 84 10 "Penetration and Firestopping " for additional work to be provided under this Section 23 00 00.
- F. The hours of training and instruction outlined in this Division 23 10 00. Include the following work as needed to perform the work of this section.
 - 1. Core drilling in accordance with Section 01 73 29 – Cutting and Patching.
 - 2. Cutting through non masonry construction in accordance with Section 01 73 29 – CUTTING AND PATCHING.
 - 3. Temporary facilities, including but not limited to stairs and ladders, staging, scaffolding, chutes and hoisting in accordance with Section 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
 - 4. Fire stop systems in accordance with Section 07 84 10 – PENETRATION FIRESTOPPING.

5. Furnish access doors and frames in accordance with Section 08 31 10 – Access Doors and Frames.

G. Change RTU filters.

1.4 RELATED WORK UNDER OTHER SECTIONS

A. The following work is included in other sections. Coordinate the work of this section as required.

B. Cutting beyond the requirements as stated herein, and patching of all openings regardless of size, is specified in the respective Sections of the trade responsible for furnishing and installing similar new materials.

C. For temporary controls refer to Section 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

D. For flashing of vents through roof and setting of roof curbs and flashing of such, refer to Division 07.

E. For power wiring of mechanical equipment refer to Section 26 00 00 - ELECTRICAL.

F. For structural steel refer to Division 05 – Metals.

G. For firestopping not called for in this Section refer to Section 07 84 10 – PENETRATION FIRESTOPPING.

H. For finished painting of mechanical systems not called for in this Section refer to Section 09 90 00 – PAINTING AND COATING.

I. Change RTU filters.

1.5 CODES, ORDINANCES, AND PERMITS

A. Perform all work in accordance with the requirements of the Town of Arlington Building Department, State of Massachusetts Building Code, and applicable State and Federal Laws. Give all requisite notices, file all requisite plans, and obtain all permits required to perform HVAC Work.

B. Refer to GENERAL CONDITIONS for local connection and permit fees and information regarding Utility Company back charges.

1.6 QUALITY ASSURANCE

A. Codes and Standards:

1. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI Hydraulic Institute Standards".

2. UL Compliance: Design, manufacture, and install HVAC pumps in accordance with UL 779 "Motor Operated Water Pumps".

3. ANSI Standards: Comply with ANSI A13.1 for pipe, valve, and equipment identification.

4. UL and NEMA Compliance: Provide boiler ancillary electrical components, which have been listed and labeled UL, and comply with NEMA Standards.

5. FM Compliance: Provide control devices and control sequences in accordance with requirements of Factory Mutual System (FM).

6. IRI Compliance: Provided control devices and control sequences in accordance with requirements of Industrial Risk Insurance (IRI).

7. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.

8. AGA Compliance: Provide gas controls and devices in accordance with American Gas Associates.

9. ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central-Station Air Handling Units", display certification symbol on units of certified models.
 10. ASHRAE Compliance: Construct and install refrigerant coils in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
 11. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".
 12. UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA standards.
 13. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of air handling units.
- B. MSS Standard Practices: Comply with the following standards for valves:
1. MSS SP-45: Bypass and Drain Connection Standard
 2. MSS SP-67: Butterfly Valves
 3. MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends
 4. MSS SP-71: Cast Iron Swing Check Valves, Flanged
 5. MSS SP-72: Ball Valves with Flanged or Butt-Welding Ends for General Service
 6. MSS SP-78: Cast Iron Plug Valves, Flanged and Threaded Ends
 7. MSS SP-80: Bronze Gate, Globe Angle and Check Valves
 8. MSS SP-84: Steel Valves - Socket Welding and Threaded Ends
 9. MSS SP-85: Cast Iron Globe and Angle Valves, Flanged with Threaded Ends
 10. MSS SP-92: MSS Valve User Guide
- C. Automatic Temperature Control Contractor Qualifications: Branch Factory Owned Authorized dealers specializing in manufacturing and installation of control system for not less than 10 years.
1. Codes and Standards:
 - a. Electrical Standards: Provide electrical components of control systems which have been UL-listed and labeled, and comply with NEMA standards.
 - b. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

1.7 DISCREPANCIES IN DOCUMENTS

- A. Where Drawings or Specifications conflict or are unclear, advise Architect in writing before Award of Contract. Otherwise, Architect's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted.
- B. Where Drawings or Specifications do not coincide with manufacturers recommendations, or with applicable codes and standards, alert Architect in writing before installation.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, for between drawings and specs, this contractor shall provide that material, installation, or work which is of the more stringent.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a system. In cases such as this, where the contractor has failed to notify the Architect of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner.

1.8 CONTRACT DRAWINGS

- A. All work shown on the Drawings is intended to be approximately correct to scale, but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting. To carry out the true intent and purpose of the plans, furnish all necessary parts to make complete working systems ready for use.
- B. The HVAC Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- C. Refer to the Architectural, Structural, and other Mechanical, Plumbing, and Electrical Drawings which indicate the construction in which this work shall be installed. Locations shown on the plans shall be checked against the general and detailed Drawings of the construction proper. All measurements must be taken at the building.

1.9 COORDINATION DRAWINGS

- A. Before materials are purchased or work is begun, the respective Subcontractor shall prepare and submit to the Architect Coordination Drawings showing the size, elevation and location of his equipment, fixtures, ductwork, conduit, 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.
- B. Coordination drawings are for the Contractor's and the Architect's use during construction and shall not be construed as replacing any shop or record drawings required elsewhere in the Contract Drawings.
- C. All coordination drawings shall be prepared in a large enough scale to accurately identify work of each trade and in addition to each sub-contractor's systems, shall also show architectural floor plan, reflected ceiling plan, and structural framing with grid identification.
- D. The coordination drawing shall be prepared in AutoCAD (version 2009 or later) and shall be started by the sheet metal sub-contractor and after applying all ductwork, the drawing shall be submitted for ductwork approval by the engineer. After approval, the drawing shall be circulated to the remaining sub-contractors for application of their work.
- E. During coordination drawing preparation the sub-contractors shall meet periodically to discuss overall coordination of all sub systems, and shall adjust their systems accordingly. When all drawings are complete the general contractor shall submit to the architect and engineers for review.
- F. Areas of conflict that cannot be resolved between the sub-contractor must be flagged on the drawings with adequate information to assist the architect and engineer in resolving noted issues.
- G. Refer to Division 01 of these Contract Documents for general requirements and additional procedures relative to the preparation of Coordination Drawings.

1.10 ACCESSIBILITY

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
- B. Extend all grease fittings to an accessible location.

1.11 ROUGH IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

1.12 NOTIFICATION OF RELATED TRADES

- A. Notify all other trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc. when ready for such installation and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.
- B. Leave openings in walls for pipes, ducts, etc. for mechanical and electrical work as shown on Drawings or required by layout of mechanical or electrical systems.

1.13 MECHANICAL INSTALLATIONS

- A. Coordinate mechanical equipment and materials installation with other building components.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.
- D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- H. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate connection of mechanical system with overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.14 CUTTING AND PATCHING

- A. Drilling, coring, and cutting of new and existing structures (through walls, floors, ceiling, etc.) where the largest dimension does not exceed 12" shall be by this Contractor.

- B. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the existing walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved coordination drawings. All cutting or coring of structural must receive approval of the Architect prior to proceeding.
- C. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.
- D. Patching of surfaces shall be by the trade responsible for the surface penetrated.
- E. Refer to related architectural sections including Section 01 73 29 – CUTTING AD PATCHING for additional reference.

1.15 SUBMITTALS

- A. Refer to Division 01 for submittal definitions, requirements, and procedures. The following paragraphs supplement the requirements of Division 01.
- B. Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by the General Contractor. Data submitted by Sub-contractors and material suppliers directly to the Architect/Engineer will not be processed.
- C. Provide submittals for the following equipment:
 - 1. Valves
 - 2. Meters and Gages
 - 3. Hangers and Attachments
 - 4. Mechanical Identification
 - 5. Mechanical Insulation
 - 6. Hydronic Piping
 - 7. HVAC Pumps and Accessories
 - 8. Rooftop Units
 - 9. Sound Attenuators
 - 10. Ductless Cooling Unit Systems
 - 11. Metal Ductwork
 - 12. Ductwork Accessories
 - 13. Air Outlets and Inlets
 - 14. Automatic Temperature Controls
 - 15. Pre-construction balancing report indicating CFM of existing fans being re-used.
 - 16. Testing, Adjusting, Balancing, and Commissioning
- D. If a Shop Drawing is not accepted after two submissions, a third submission from the same manufacturer will not be considered.
- E. Check Shop Drawings and other submittals to assure compliance with contract documents before submittal to A/E.

- F. Review of Shop Drawings is final and no further changes shall be considered without written application. Shop Drawings review does not apply to quantities, nor relieve this Contractor of his responsibility for furnishing materials or performing his work in full compliance with these Contract Drawings and Specifications. Review of these shop drawings shall not be considered a guarantee of the measurements of this building or the conditions encountered.

1.16 SUBSTITUTIONS

- A. Refer to 01 33 01 – SUBSTITUTIONS / OR EQUAL REQUEST FORM for requirements in requesting substitutions. The following paragraphs supplement the requirements of Section 01 33 01.
- B. If materials or equipment are substituted for specified items that alter the systems shown or its physical characteristics, or which have different operating characteristics, clearly note the alterations or difference and call it to the attention of the a/e. Under no circumstances shall substitutions be made unless material or equipment has been successfully operated for at least three consecutive years.
- C. Any modifications to the design, as a result of approving a substitution, shall be the responsibility of this contractor. Any additional cost to this contractor or any other contractor, directly or indirectly, as a result of such substitutions, shall be the responsibility of this contractor.

1.17 PRODUCT LISTING

- A. Prepare listing of major mechanical equipment and materials for the project.
- B. Provide all necessary information.
- C. Submit to the A/E through the General Contractor, within twenty (20) days of signing contract, this listing indicating all equipment and manufacturers, as a part of the submittal requirement. If the product list is not submitted, it will be the responsibility of the sub-contractor to submit one (1) of the three (3) named equal manufacturers.
- D. When two or more items of same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in work, except as otherwise indicated.
- E. Provide products, which are compatible within systems and other connected items.

1.18 NAMEPLATE DATA

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, mode, number, serial number, capacity, operating, and power characteristics labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

1.19 DELIVERY, STORAGE AND HANDLING

- A. Refer to Section General Conditions for delivery, storage, and handling of equipment. The following paragraphs supplement the requirements of Section General Conditions.

- B. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- C. Store equipment and materials at the site, unless off-site storage is authorized in writing. Protect stored equipment and materials from damage.
- D. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

1.20 RECORD DOCUMENTS

- A. Refer to Division 01, the general conditions, and the supplementary conditions for requirements for maintaining as built drawings and submitting reproducible record documents. The following paragraphs supplement the above.
- B. Provide electronic AutoCAD drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.

1.21 OPERATION AND MAINTENANCE DATA

- A. Refer to Division 01 for procedures and requirements for preparation and submittal of maintenance manuals, training of owner personnel and related close-out procedures. The following paragraphs supplement the requirements of Division 01.
- B. In addition to the information required by Division 01 for maintenance data, include the following information:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and user summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and trouble-shooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.
 - 5. Provide DVD recording of operation and maintenance training sessions and include as part of O & M Manual submittal. Provide indexed table of contents for DVD recording.

1.22 WARRANTIES

- A. The contractor shall provide a one (1) year minimum warrantee on all product (unless otherwise stated in the product specification for a specific product) and labor for work under this section. Refer to general conditions for additional warranty requirements.
- B. Refer to Division 01 for additional procedures and submittal requirements for warranties.

1.23 SUSTAINABLE DESIGN INTENT

- A. Comply with project requirements.
 - 1. Refer to Division 01 for material, procedure, and documentation submittal requirements.
 - 2. High efficiency filters – Install MERV 13 filters in all HVAC equipment requiring filtration media immediately prior to occupancy.
 - 3. Air intake location – Locate outside air intake openings a minimum of 25 feet from any hazard or noxious contaminants such as chimneys, plumbing vents, cooling towers, streets, alleys, parking lots, and loading docks. The distance between exhaust air or vent outlets and air intakes should be the greater of 25 feet or the distance as determined by MA State Building Code. Exception, when locating an air intake within 25 feet of a contaminant source is unavoidable, such opening shall be a minimum of 2 feet below the contaminant source and 10 feet horizontally from the nearest edge of the air intake to the nearest edge of the contaminant source. All intakes must be 6 feet above landscaped grade including soil, lawn, shrubs, or any plant life within 1.5 feet horizontally of intake.

1.24 ENERGY REBATE PROGRAM

- A. This project has been designed to incorporate equipment approved for energy rebate such as high efficiency motors, pumps, RTU, VRF System, etc. Meet with Utility Company prior to submitting shop drawing to ascertain that submittal meets program guidelines. All applicable submitted equipment shall meet utility company rebate program efficiency requirements. Contractor shall furnish equipment submittals, related equipment/system pricing data and all required rebate application information, forms, etc. to utility company.

1.25 DEMOLITION

- A. Demolition of Existing Mechanical Work:
 - 1. Disconnect all existing materials, fixtures and equipment indicated to be salvaged.
 - 2. Disconnect and cap all existing mechanical lines from building as indicated on drawings.
 - 3. Notify General Contractor when existing fixtures, materials, equipment and other features are ready for removal, salvaging, and disposal under Section 02 41 00 - DEMOLITION.
- B. Where existing heating equipment (i.e. coils, fans, radiation, pumps etc.) are called to be removed, it shall include all associated piping, valves, wiring, controls, hangers, associated ductwork, and all associated appurtenances.
- C. Where existing piping (i.e. water, steam, condensate, drain etc.) and ductwork are called to be removed, it shall include all associated hangers, insulation, valves, controls, dampers and all associated appurtenances.
- D. This Sub-contractor shall disconnect, lower to floor, and stack near-by all noted mechanical systems being removed. The General Contractor shall remove from the building and dispose of in a legal manner.
- E. Demolition work shall be performed per architectural phasing plans and specifications.

1.26 PHASING

- A. The mechanical subcontractor shall construct the subject project in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

- B. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural drawings.

1.27 ALTERNATES

- A. Refer to architectural drawings and specifications for additional information in regards to each Alternate for the project.
- B. Alternate 1. Any work that is associated with reconfiguring the File Storage Room, Waiting Room and Corridors. No HVAC impact for this alternate.
- C. Alternate 2 (Deduction). The new roof top unit RTU-1 and the associated roof curb adaptor being provided under the base bid will be eliminated from this project. The existing roof top unit that serves the space will remain. Under a separate project, the owner will provided the necessary equipment to reuse the existing RTU to satisfy the ventilation requirements.
 - 1. The contractor for this project will provide a new air cooled condensing unit in the capacity indicated on the Mechanical Schedules. The air cooled condensing unit ACC-1 shall be mounted on the roof in a final location coordinated with the owner.
 - 1. The owner shall be responsible for providing all additional equipment to modify the existing roof top unit under a separate project except for ACC-1. Owner provided equipment that will be provided under a separate project to reuse the existing roof top unit for the required ventilation to the sixth floor office spaces will include but may not limited to the equipment listed below:
 - a. Duct mounted cooling coil, associated drainage and refrigerant piping.
 - b. New motors with variable frequency drives for the supply and return fans to accommodate revised fan capacities.
 - c. Associated BMS/ATC controls for RTU-1.

PART 2 - PRODUCTS

2.1 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

- A. General: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
 - 1. All motors for all mechanical equipment shall be NEMA premium efficiency matching the following:

	HP	RPM	Efficiency
a.	1	1800	85.5%
b.	1.5	1800	86.5%
c.	2	1800	86.5%
d.	3	1800	89.5%
e.	5	1800	89.5%
f.	7.5	1800	91.0%
g.	10	1800	91.7%
h.	15	1800	93.0%
i.	20	1800	93.0%
j.	25	1800	93.6%
k.	30	1800	94.1%
l.	40	1800	94.1%
m.	50	1800	94.5%
 - 2. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.

3. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
 4. Temperature Rating: Rated for 40° C. environment with maximum 50° C temperature rise for continuous duty at full load (Class F Insulation). All ratings shall be for inverter duty applications.
 5. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
 6. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
 7. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
 8. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
 9. Bearings:
 - a. Ball or roller bearings with inner and outer shaft seals.
 - b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
 - c. Designed to resist thrust loading where belt drivers or other drives produce lateral or axial thrust in motor.
 - d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
 10. Enclosure Type:
 - a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
 - b. Guarded drip-proof motors where exposed to contact by employees or building occupants.
 - c. Weather protected Type I for outdoor use, Type II where not housed.
 11. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
 12. Noise Rating: "Quiet".
 13. Efficiency: "Premium Efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors", in accordance with IEEE Standard 112, Test Method B.
 14. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
- B. STARTERS, ELECTRICAL DEVICES, AND WIRING: (PROVIDED BY THE HVAC CONTRACTOR FOR EACH PACKAGED PIECE OF HVAC EQUIPMENT REQUIRING SUCH):
1. Motor Starter Characteristics:
 - a. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.
 - b. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.
 2. Manual Switches shall have:
 - a. Pilot lights and extra position for multi-speed motors.
 - b. Overload Protection: Melting alloy type thermal overload relays.
 3. Magnetic Starters:
 - a. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
 - b. Trip-free thermal overload relays, each phase.
 - c. Interlocks, pneumatic switches and similar devices as required for co-ordination with control requirements of Division 23 Controls Sections.
 - d. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.

- e. Externally operated manual reset.
- f. Under-voltage release or protection.
- 4. Capacitors:
 - a. Individual unit cells.
 - b. All welded steel housing.
 - c. Each capacitor internally fused.
 - d. Non-flammable synthetic liquid impregnant.
 - e. Craft tissue insulation.
 - f. Aluminum foil electrodes.
 - g. KVAR size shall be as required to correct motor power factor to 90% or better and shall be installed on all motors 1 horsepower and larger, that have an uncorrected power factor of less than 85% at rated load.
- 5. Disconnect Switches:
 - a. Fusible Switches: Fused, each phase; general duty; horsepower rated; non-teasible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.
 - b. Non-fusible Switches: For equipment 2 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

2.2 HANGERS & ATTACHMENTS (Refer to section 23 05 48 for coordination)

- A. Horizontal-Piping Hangers and Supports:
 - 1. General: Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacture for each piping service. Select size of hangers and supports to exactly fit pip size for bare piping, and to insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
 - a. Adjustable Steel Clevises Hangers: MSS Type 1.
 - b. Steel Pipe Clamps: MSS Type 4.
 - c. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
 - 1) Plate: Unguided type.
 - 2) Plate: Guided type.
 - 3) Plate: Hold-down clamp type.
 - d. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
 - e. Pipe Stanchion Saddles: MSS Tube 37, including steel pip base support and cast-iron floor flange.
 - f. Adjustable Pipe Saddle Supports: MSS Type 38, including steelpipe base support and cast-iron floor flange.
 - g. Single Pipe Rolls: MSS Type 41.
 - h. Adjustable Roller Hangers: MSS Type 43.
 - i. Pipe Roll Stands: MSS Type 44.
 - j. Pipe Rolls and Plates: MSS Type 45.
 - k. Adjustable Pipe Roll Stands: MSS Type 46.
 - 2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.

- d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.
- B. Vertical-Piping Clamps:
- 1. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps, complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
 - a. Two-Bolt Riser Clamps: MSS Type 8.
 - b. Four-Bolt Riser Clamps: MSS Type 42.
 - 2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.
 - d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.
- C. Hanger-Rod Attachments:
- 1. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-pipe hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
 - a. Steel Turnbuckles: MSS Type 13.
 - b. Swivel Turnbuckles: MSS Type 15.
 - c. Malleable Iron Sockets: MSS Type 16.
 - 2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.
 - d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.
- D. Building Attachments:
- 1. General: Except as otherwise indicate, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
 - a. Concrete Inserts: MSS Type 18.
 - b. Top Beam C-Clamp: MSS Type 19.
 - c. Side Beam or Channel Clamps: MSS Type 20.
 - d. Center Beam Clamps: MSS Type 21.
 - e. Welded Beam Attachments: MSS Type 22.
 - f. C-Clamps: MSS Type 23.
 - g. Top Beam Clamps: MSS Type 25.
 - h. Side Beam Clamps: MSS Type 27.
 - i. Steel Beam Clamps W/Eye Nut: MSS Type 28.
 - j. Linked Steel Clamps W/Eye Nut: MSS Type 29.

- k. Malleable Beam Clamps: MSS Type 30.
 - l. Steel Brackets: One of the following for indicated loading:
 - 1) Light Duty: MSS Type 31.
 - 2) Medium Duty: MSS Type 32.
 - 3) Heavy Duty: MSS Type 33.
 - m. Side Beam Brackets: MSS Type 34.
 - n. Plate Lugs: MSS Type 57.
 - o. Horizontal Travelers: MSS Type 58.
 - 2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
 - a. Carpenter and Patterson, Inc.
 - b. Corner & Lada Co., Inc.
 - c. Elcen Metal Products Co.
 - d. Fee & Mason Mfg. Co.; Div. Figgie International
 - e. ITT Grinnel Corp.
- E. Saddles and Shields:
- 1. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
 - 2. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
 - 3. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
 - 4. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
 - a. Elcen Metal Products Co.
 - b. Pipe Shields, Inc.
 - c. Carpenter Patterson, Inc.
 - d. ITT Grinnel Corp.
- F. Miscellaneous Materials:
- 1. Metal Framing: Provide products complying with NEMA STD ML 1.
 - 2. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A 36.
 - 3. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
 - 4. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
 - 5. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

2.3 MECHANICAL IDENTIFICATION

- A. Plastic Pipe Markers:
- 1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1
 - 2. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1

3. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125° F (52°C) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.
 4. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
 - a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
 - b. Adhesive lap joint in pipe marker overlap.
 - c. Laminated or bonded application of pipe marker to pipe (or insulation).
 - d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".
 5. Application: Provide pipe labels for the following piping system:
 - a. Refrigerant liquid and suction.
 - b. Condensate drain.
- B. Ductwork Labels: Provide labels for exhaust, supply and return systems.

2.4 MECHANICAL INSULATION

- A. Piping Insulation Materials:
1. Fiberglass Piping Insulation: ASTM C 547, Class 45 required.
 - a. Class 1 for use to 450 degrees F; Class 2 for use to 650 degrees F; Class 3 for use to 1200 degrees F.
 2. Flexible Unicellular Piping Insulation: ASTM C 534, Type as required.
 - a. Type I - tubular; Type II - sheet. For use between -40 degrees F and 200 degrees F.
 3. Jackets for piping Insulation: ASTM C 921, with vapor barrier for piping with temperatures below ambient.
 4. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
 5. Encase straight pipe insulation, where exposed in occupied areas, with one piece 20-mil thick PVC Jacketing. Fasten and seal as per manufacturer's recommendations.
 6. Encase exterior piping insulation with aluminum jacket with weather-proof construction.
 7. Staples, Bands, Wires and Cement: As recommended by insulation manufacturer for applications indicated.
 8. Adhesives, Sealants and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
- B. Piping Insulation Application and Thickness:
1. Application: Cold Piping (40 Degrees F to Ambient):
 - a. Insulate the following cold HVAC piping systems:
 - 1) Air conditioner condensate drain piping.
 - 2) Refrigerant liquid and suction piping.
 - b. Insulate HVAC make-up condensate drain and refrigerant piping system specified above with the following type and thickness of insulation:
 - 1) Fiberglass: 1 1/2" thick for all pipe sizes.
 - c. Insulate all chilled water piping with 1 ½" fiberglass for all sizes.
 2. Insulation of Piping Exposed to Weather: Protect outdoor insulation from weather by installing outdoor protective finish aluminum jacketing installed as recommended by the manufacturer. Insulation thickness shall be increased by one size versus specified pipe insulation thickness.

C. Ductwork Insulation Materials:

1. Rigid Fiberglass Ductwork Insulation (R-8): ASTM C 612, Class as required.

CLASS 2 - 400 DEGREES F; 4 LBS./FT³.

CLASS 3 - 850 DEGREES F; 12 LBS./FT³.

CLASS 4 - 1000 DEGREES F; 12 LBS./FT³.

CLASS 5 - 1800 DEGREES F; 20 LBS./FT³.

2. Flexible Fiberglass Ductwork Insulation (R-5): ASTM C 512, Class as required.

CLASS 2 - 400 DEGREES F; .75 LBS./FT³.

CLASS 3 - 850 DEGREES F; 1.5 LBS./FT³.

3. Jackets for Ductwork Insulation: ASTM C 921, with vapor barrier.
4. Ductwork Insulation Accessories: Provide staples, bands, wire, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
5. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

D. Ductwork Insulation Application and Thickness:

1. Application: Ventilation and AC System Ductwork:

- a. Insulate the following ductwork:

- 1) Outdoor air intake ductwork between air entrance and air handling unit inlet.
- 2) HVAC supply ductwork between HVAC unit discharge and room terminal outlet.
- 3) Insulate neck and bells of supply diffusers.
- 4) HVAC return ductwork between room terminal inlet and HVAC unit inlet; except omit insulation on return ductwork located in return air ceiling plenums.
- 5) HVAC plenums and unit housing not pre-insulated at factory or lined.
- 6) Exhaust ductwork between in-line exhaust fan and point of exit in building.

- b. Insulate each ductwork system specified above with the following type and thickness of insulation:

- 1) Rigid Fiberglass: In machine rooms, fan rooms, and mechanical spaces insulate all supply air, return air and outside air ductwork with 2" thick rigid (minimum R-8). All exposed outdoor ductwork in occupied areas shall be insulated internally with same thickness and material.
- 2) Flexible Fiberglass: 1-1/2" thick (minimum R-5), application limited to concealed locations which shall include above ceilings, in chases, shafts etc.
- 3) All outside air ductwork shall be 2" rigid (R-8).

2. Outdoor Ductwork:

- a. Provide 2 in. rigid board insulation on all exterior ductwork and weatherproofing.

- b. Acceptable Manufacturers:

- 1) Flex Cladd
- 2) Polyguard Alumaguard
- 3) VentuReclad.Plus
- 4) Or equal pending approval

E. Equipment Insulation Materials:

1. Rigid Fiberglass Equipment Insulation (R-8): ASTM C 612, Class as required.

CLASS 2 - 400 DEGREES F; 12 LBS./FT3.

CLASS 3 - 850 DEGREES F; 12 LBS./FT3.

CLASS 4 - 1000 DEGREES F; 12 LBS./FT3.

CLASS 5 - 1800 DEGREES F; 20 LBS./FT3.

2. Flexible fiberglass Equipment Insulation (R-5): ASTM C 553, Type and Class as required.

TYPE I - RESILIENT, FLEXIBLE;

CLASS B-1 - 0.65 LBS./FT3

CLASS B-2 - 0.75 LBS./FT3

CLASS B-3 - 1.00 LBS./FT3

CLASS B-4 - 1.50 LBS./FT3

CLASS B-5 - 2.00 LBS./FT3

CLASS B-6 - 3.00 LBS./FT3

TYPE II - FLEXIBLE; CLASS F-1 - 4.50 LBS./FT3

TYPE III - SEMIRIGID; CLASS F-2 - 4.50 LBS./FT3

3. Flexible Unicellular Equipment Insulation: ASTM C 534, Type as required.

TYPE I - TUBULAR.

TYPE II - SHEET.

4. Jacketing material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.
5. Equipment Insulation Compounds; Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
6. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

F. Equipment Insulation Application and Thickness:

1. Application: Cold Equipment (Below Space Temperature)

2.5 HYDRONIC PIPING AND ACCESSORIES

- A. Refer to Part 3 for piping requirements for each system

- B. Manufacturer: Subject to compliance with requirements, provide piping system products from one of the following:

C. Pipe and Tubing Materials

1. Copper Tubing: ASTM grade B 88, Type L hard drawn temper copper tubing.
2. PVC: ¼" Clear PVC hose tubing.
3. PVC: Schedule 40

2.6 REFRIGERANT PIPING

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for refrigeration piping where applicable, base pressure rating on refrigerant piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in refrigerant piping systems. Where more than one type of materials and products are indicated, selection is Installer's option.
- B. Material: Provide pipes and pipe fittings in accordance with the following listing:
1. Tube Size 4-1/8" and Smaller: Copper tube; Type ACR, hard-drawn temper; wrought-copper, solder-joint fittings; brazed joints.
- C. Soldered Joints: Solder joints using silver-lead solder, ASTM B32, Grade 96 TS.
- D. Brazed Joints: Braze joints using American Welding Society (AWS) classification BCUO-4 for brazing filler metal.
- E. Piping Specialties: Provide piping specialties complying with Division 23 00 01 "Hydronic Piping" in accordance with the following listing:
1. Pipe escutcheons.
 2. Drip pans.
 3. Sleeves.
 4. Sleeve seals.
- F. Refrigerant Valves: Special valves required for refrigerant piping include the following types.
1. Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300 degrees F (149 degrees C) temperature rating, 500 PSI working pressure.
 2. Check Valves: Forged brass, accessible internal parts, soft synthetic seat, fully guided piston and stainless steel spring, 250 degrees F (121 degrees C) temperature rating, 500 PSI working pressure.
 3. Manufacturer: Subject to compliance with requirements, provide globe and check valves of one of the following:
 - a. Henry Valve CO.
 - b. Parker Hannifin Corp.; Refrigeration & Air Cond. Div.
 - c. Sporlan Valve Co.
 4. 2-Way Solenoid Valves: Forged brass, designed to conform to ARI 760, normally closed, teflon valve seat, NEMA 1 solenoid enclosure, 24 volt, 60 Hz., UL-listed, 1/2" conduit adapter, 250 degrees F (121 degrees C) temperature rating, 400 PSI working pressure.
 5. Manufacturer: Subject to compliance with requirements, provide solenoid valves of one of the following:
 - a. Alco Controls Div.; Emerson Electric Co.
 - b. Automatic Switch Co.
 - c. Sporland Valve Co.
 6. Refrigerant Strainers: Brass shell and end connections, brazed joints, monel screen, 100 mesh, UL-listed, 350 PSI working pressure.
 7. Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL-listed, 200 degrees F (93 degrees C) temperature rating, 500 PSI working pressure.

8. Refrigerant Filter-Driers: Steel shell, ceramic fired desiccant core, solder connections, UL-listed, 500 PSI working pressure.
 9. Refrigerant Filter-Driers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron coverplate with steel cap screws, replaceable filter-drier core, 500 PSI working pressure.
 10. Evaporator Pressure Regulators: Provide corrosion-resistant, spring loaded, stainless steel springs, pressure operated, evaporator pressure regulator, in size and working pressure indicated, with copper connections.
 11. Refrigerant Discharge Line Mufflers: Provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL-listed.
 12. Manufacturer: Subject to compliance with requirements, provide refrigeration accessories of one of the following:
 - a. Alco Controls Div.; Emerson Electric CO.
 - b. Henry Valve CO.
 - c. Parker-Hannifin Corp.; Refrigeration & Air Conditioning Div.
 - d. Sporlan Valve Co.
- G. Basic Vibration Control: Provide vibration control products as required in accordance with the following listing:
1. Isolation hangers.
 2. Riser isolators.
 3. Riser support isolators.
 4. Flexible pipe connectors.

2.7 ROOFTOP UNITS

- A. MANUFACTURERS
1. Subject to compliance with requirements specified here within provide rooftop units as manufactured by McQuay, Greenheck, Annex Air, Aaon (Custom), Valent or approved equal by the engineer.
 2. Alternate pricing based on pre-approved manufacturers will be considered if the following performance requirements and construction techniques are adhered to in all respects. Any substitutions shall be approved by the Architect/Engineer/Owner in writing ten (10) days prior to bid.
- B. GENERAL
1. Rooftop air handling units shall be capable of energy recovery. Units shall be of the configuration, capacity, and style as indicated on the drawings and Equipment Schedule and as specified herein. Through properly designed access; ease of maintenance, removability of components, and unit serviceability shall be assured.
 2. The unit shall be constructed for outdoor installation. Outdoor unit to be provided with weatherproofing outside air intake hood and shutoff dampers for supply and exhaust.
- C. General Description
1. Furnish as shown on plans. Unit performance and electrical characteristics shall be per the job schedule.
 2. Provide the unit with the following sections at a minimum:
 - a. Return fan/economizer section
 - b. Filter sections
 - c. Supply fan section
 - d. Hot water coil section
 - e. Access sections
 - f. Cooling coil section

- g. Diffuser (as required)
- h. Discharge/intake plenums
- 3. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Units shall be of a modular design with factory installed access sections available to provide maximum design flexibility.
- 4. Unit is to be shipped factory assembled in one complete section, when possible. Each unit shall be completely factory assembled and shipped in one piece.
- 5. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include final balancing of the supply and return fan assemblies and a heating and cooling coil leak test.
- 6. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
- 7. The Rooftop unit shall be designed, manufactured, and independently tested, rated, and certified to meet the seismic standards of the 2009 International Building Code and ASCE 7-06.
 - a. Certificates of Compliance shall be provided with the submittal and include the manufacturer's identification, designation of certified characteristics, and the Independent Certifying Agency's name and report identification.
 - b. Clear installation instructions shall be provided including all accessory components.
- 8. Performance: All scheduled capacities and face areas are minimum accepted values. All scheduled amps, kW, and hp are maximum accepted values that allow scheduled capacity to be met.
- 9. Warranty: The manufacturer shall provide 12-month parts only warranty. The manufacturer will provide extended 5 year, parts only warranty on the compressor. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence upon project completion date.

D. Cabinet, Casing and Frame

- 1. Provide double-wall construction for all side wall access doors and floor areas shall be provided with 17 gauge exterior and 22-gauge interior, solid G60 galvanized steel construction. Inner liners shall protect insulation during service and maintenance.
- 2. Insulation on ceiling and end panels shall be secured with adhesive and mechanical fasteners. Heavy gauge solid galvanized steel liners shall be provided throughout, allowing no exposed insulation within the air stream.
- 3. All cabinet insulation, except floor panels, shall be a nominal 2" thick, 1½-lb. density, R6.5, glass fiber. A combination of solid and perforated galvanized steel liners shall be provided throughout. Perforated liners to be used in the supply and return air plenums to provide improved sound attenuation. Insulation under perforated liners shall be coated with hospital grade liner rated in accordance with standard ASTM C-1071.
- 4. All floor panels shall include double wall construction and include a nominal 2" thick, 3 lb. density, R4.2 per inch glass fiber insulation.
- 5. Exterior surfaces shall be constructed of pre-painted galvanized steel for aesthetics and long term durability. Paint finish to include a base primer with a high quality, polyester resin topcoat of a neutral beige color. Finished surface shall withstand a minimum 750-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance. Service doors shall be provided on both sides of each section in order to provide user access to all unit components.
- 6. Service doors shall be constructed of heavy gauge galvanized steel with a gauge, galvanized steel interior liner. All service doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system that is operated by a single, flush-mounted handle. The latch system shall feature a staggered engagement for ease of operation. Removable panels, or doors secured by multiple, mechanical fasteners are not acceptable.

7. The unit base frame shall be constructed of 13-gauge pre-painted galvanized steel. The unit base shall overhang the roof curb for positive water runoff and shall have a formed recess that seats on the roof curb gasket to provide a positive, weather-tight seal. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.
 8. Cabinet construction of the unit can be reviewed to be an acceptable equal.
- E. Supply and Return Fans
1. All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment. All fan assemblies shall employ solid steel fan shafts. Heavy-duty pillow block type, self-aligning, grease-lubricated ball bearings shall be used. Bearings shall be sized to provide an L-50 life at 200,000 hours. The entire fan assembly shall be isolated from the fan bulkhead and mounted on spring isolators with seismic restraints.
 2. Adjustable pitch V-belt drives with matching belts shall be provided. V-belt drives shall be selected at manufacturer's standard service factor of 1.5 times fan brake horsepower.
 3. Fan motors shall be heavy-duty 1800 rpm open drip-proof (ODP) type with grease-lubricated ball bearings. Motors shall be premium efficiency and meet applicable EPACT/NEMA requirements. Motors shall be mounted on an adjustable base that provides for proper alignment and belt tension adjustment.
 4. Airfoil type supply and return (exhaust) fans - supply fans shall be double width, double inlet (DWDI) airfoil centrifugal fan. All fans shall be mounted using shafts and hubs with mating keyways. Fans shall be Class II type and fabricated from heavy-gauge aluminum. Fan blades shall be continuously welded to the back plate and end rim. The supply air fan and return air fan sections shall be provided with an expanded metal belt guard.
- F. Variable Air Volume Control
1. Provide variable frequency drive for the supply and return air fan. Two independent drives, one per fan, shall be provided. Drives shall meet UL Standard 95-5V and the variable frequency drive manufacturer shall have specifically approved them for plenum duty application.
 2. A manual bypass contactor arrangement shall be provided. The arrangement will allow fan operation at full design cfm, even if the drive has been removed for service. Line reactors shall be factory installed for each drive. Variable frequency drives shall be equipped with features as indicated in Division 26 00 00 Variable Frequency Drive specification requirements.
 3. The supply air fan drive output shall be controlled by the factory installed main unit control system and drive status and operating speed shall be monitored and displayed at the main unit control panel. The supply and return/exhaust fan drive outputs shall be independently controlled in order to provide the control needed to maintain building pressure control. Supply and return/exhaust air fan drives that are slaved off of a common control output are not acceptable.
 4. All drives shall be factory run tested prior to unit shipment.
- G. Electrical
1. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with unit shall be numbered and color-coded and labeled according to the electrical diagram provided for easy identification.
 2. A factory installed and wired marine service light, with switch and receptacle, shall be provided in the supply air and return/exhaust fan section. The separate, main unit service receptacle electrical circuit shall also power the light circuit.
 3. A factory installed and wired 115 volt power supply shall be provided for the GFI receptacle. The power supply shall be wired to the line side of the disconnect so the receptacle is powered when the main unit disconnect is off. This option shall include a weather proof transformer and disconnect for the 115 volt GFI. The 115 volt GFI electrical circuit shall complete with primary fused short circuit protection.

4. Phase failure and under voltage protection on three-phase motors shall be provided to prevent damage from single phasing, phase reversal, and low voltage conditions.
 5. Ground fault protection shall be provided to protect against arcing ground faults.
 6. Smoke detectors shall be field installed as shown on the drawings. Smoke detectors shall be furnished and wired to the building Fire Alarm system by the Division 26 00 00 Contractor and installed by the HVAC Contractor.
 7. Disconnect switches shall be provided by Division 26 00 00.
- H. Cooling Sections
1. The cooling coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with factory piped cooling coil and sloped stainless steel drain pan. Hinged access doors on both sides of the section shall provide convenient access to the cooling coil and drain pan for inspection and cleaning.
 2. Submittals must demonstrate that scheduled unit leaving air temperature (LAT) is met, that fan and motor heat temperature rise (TR) have been considered, and scheduled entering air temperature (EAT) equals mixed air temperature (MAT). Draw-through cooling—Scheduled EAT equals cooling coil EAT and scheduled unit LAT equals cooling coil LAT plus TR.
 3. A stainless steel, positively sloped drain pan shall be provided with the cooling coil. The drain pan shall extend beyond the leaving side of the coil and underneath the cooling coil connections. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall be connected to a threaded drain connection extending through the unit base. Units with stacked cooling coils shall be provided with a secondary drain pan piped to the primary drain pan. Drain pan connections shall be field trapped per manufacturer's instructions and piped to the nearest roof drain to prevent ponding on the roof.
- I. Filters
1. Unit shall be provided with filter sections. The filter sections shall be supplied complete with the filter rack as an integral part of the unit. The draw-through filter section shall be provided with panel and cartridge filters.
 2. Filters shall be frame mounted and shall slide into galvanized steel racks contained within the unit. Filters shall be installed in an angular arrangement to maximize filter area and minimize filter face velocity. Filters shall be accessible from both sides of the filter section.
 3. 4" deep MERV 13, efficient, UL Std. 900, Class 1, AmericanAirFilter cartridge filters shall be provided. 2" panel, 30% efficient pre-filters shall be included. Cartridge filters shall consist of filter media permanently attached to a metal frame and shall slide into a gasketed, extruded aluminum rack contained within the unit. The filter rack shall have secondary gasketed, hinged end panels to insure proper sealing. Filters shall be accessible from both sides of the filter section.
- J. Outdoor / Return Air Section
1. Return Air Plenum- Unit shall be provided with a return air plenum capable of for handling 100% re-circulated air. The 100% return air plenum shall allow return air to enter from the bottom of the unit. McQuay UltraSeal or equal low leak dampers shall be provided. Damper blades shall be fully gasketed and side sealed and arranged vertically in the hood. Damper leakage shall be less than 0.2% at 1.5 inches static pressure differential. Leakage rate to be tested in accordance with AMCA Standard 500. Damper blades shall be operated from multiple sets of linkages mounted on the leaving face of the dampers. Control of the dampers shall be from a field installed modulating actuator provided by the ATC contractor.
- K. Energy Recovery Section and Components
1. Provide unit shall be provided with a modulating outdoor air economizer section. The economizer section shall include outdoor, return and return exhaust air dampers.

2. Outdoor air shall enter at the back of the section through a factory-installed hood capable of handling 100% outdoor air. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same prepainted finish as the main unit. The hood shall include a bird screen to prevent infiltration of foreign material and a rain lip to drain water away from the entering air stream. Return air shall enter through the bottom of the unit.
 3. The entire section shall be double-wall construction.
 4. Drive systems shall consist of fractional horsepower A.C. drive motors with multilink drive belts. The wheel shall be tested in accordance with NFPA or UL guidelines and shall be UL recognized or equivalent.
 5. All necessary exhaust fan motors, branch short circuit protection, and wiring shall be provided.
- L. Access Sections - Unit shall be provided with factory installed access sections located as shown/indicated on the drawings. Access sections shall have hinged access doors on both sides of the section and shall have the same construction features as the rest of the unit.
- M. Discharge and Return Plenum - A supply air discharge plenum shall be provided. The plenum section shall be lined with a perforated acoustic liner (rated per ASTM C1071 Standards) to enhance sound attenuation. The plenum section shall have a discharge opening. Isolation dampers shall be provided in the return air opening and supply air openings. Actuators shall be provided by the ATC contractor to close the dampers when the fans are not running.
- N. Roof Curb – refer to Section 23 05 48
- O. Controls
1. General – Automatic Temperature controls for Rooftop unit shall be DDC (direct digital control type). All sensors, actuators, controls not indicated in the specifications above shall be provided by the ATC/DDC controls contractor.
 2. Unit manufacturer shall provide terminal strips for all control devices not furnished by ATC contractor.
 3. Refer to Specification Section 23 00 00 HVAC requirements and Control Diagram Drawings for Rooftop unit control requirements and expanded sequence of operation and required points list.
 4. HVAC and ATC Contractors shall coordinate with unit manufacturer to ensure all sequence of operation and control points are achieved with the BMS to complete the specified sequence of operation and points lists.

2.8 METAL DUCTWORK

- A. Ductwork Materials:
1. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including piping, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.
 2. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock forming quality, with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations.
 3. Stainless Steel Sheet: Where indicated, provide stainless steel complying with ASTM A 167; Type 302, 304, or 316; with No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation. For exposed stainless steel ductwork, provide matching stainless steel support materials. Provide 316 Stainless steel ductwork for Science Fume exhaust ductwork.

- B. Miscellaneous Ductwork Materials:
1. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
 2. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15 degree change of direction per section. Unless specifically detailed otherwise, use 45 degree laterals and 45 degree elbows for branch takeoff connections. Where 90 degree branches are indicated, provide conical type tees.
 3. Duct Liner: Refer to "Acoustic Duct Lining Section".
 4. Duct Liner Adhesive: Comply with ASTM C 916 "Specification for Adhesives for Duct Thermal Insulation".
 5. Duct Liner Fasteners: Comply with SMACNA HVAC Duct construction Standards, Article S2.11.
 6. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation details, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
 7. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
 8. Flexible Ducts: Corrugated aluminum complying with UL 181.
 - a. Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.
- C. Fabrication:
1. Shop fabricated ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassembled work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.
 2. Shop fabricated ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".
 3. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1-1/2 times associated duct width; or squared metered elbows with double thickness turning vanes. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.
 4. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to section "Ductwork Accessories" for accessory requirements.
 5. Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners.
- D. Factory-Fabricated Low Pressure Round:
1. General: Provide factory-fabricated duct and fittings.
 2. Material: Material type shall be as indicated or, galvanized sheet steel complying with ASTM A 527, lock forming quality, with ASTM A 525, G90 zinc coating, mill phosphatized.
 3. Gage: 28-gage minimum for round and oval ducts and fittings, 4" through 24" diameter.
 4. Seams: All seams shall be spiral lockseams.
 5. Elbows: One piece construction for 90 degrees and 45 degree elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.
 6. Divided flow Fittings: 90 degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.

7. Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following:
 - a. Semco Mfg., Inc.
 - b. United Sheet Metal Div., United McGill Corp.

2.9 DUCTWORK ACCESSORIES

A. Dampers:

1. Low Pressure Manual Dampers: Provide dampers of single blade type or multi-blade type, constructed in accordance with SMACNA "HVAC Duct construction Standards".
2. Automatic Control Dampers: Refer to Division 23 section "Automatic Temperature Control" for control dampers; not work of this section.
3. Backdraft Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at .05" static pressure. Construct blades of 16-ga. aluminum; provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct from 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under: 4" x 1-1/4" x 16 ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up. Provide felted or rubber trim to assure tight, leak-proof seal when closed.
4. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
 - a. Air Balance, Inc.
 - b. Airgarde Corp.
 - c. American Warming & Ventilating, Inc.
 - d. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
 - e. Louvers & Dampers, Inc.
 - f. Penn Ventilator Co.
 - g. Ruskin Mfg. Co.

B. Fire Dampers:

1. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga. galvanized steel. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide out of air stream type damper in open position and with positive lock in closed position with stainless steel heat treated type 301 closure spring, and with the following additional features:
 - a. Damper Blade Assembly: Curtain type.
 - b. Blade Material: Steel, match casing.
 - c. Blade Material: Stainless steel.
2. Combination Fire/Smoke Dampers: Provide fire/smoke dampers, of types and sizes indicated. Construct casing of 11-ga. galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide additional frangible link containing explosive charge, connected in series with fusible link. Provide stainless steel spring loaded leakage seals in sides of casing, and 36" long wire leads for connecting smoke link to smoke detector, and the following additional features:
 - a. Damper Blade Assembly: Single-blade type.
 - b. Damper Blade Assembly: Multi-blade type.
 - c. Damper Blade Assembly: Curtain type.
 - d. Blade Material: Steel, matching casing.
 - e. Blade material: Stainless steel.

3. Motor-Driven Fire/Smoke Dampers: Provide motor-driven fire/smoke dampers in types and sizes indicated, with casing constructed of 11-ga. galvanized steel with bonded red acrylic enamel finish, fusible link 160 to 165 degrees F (71 to 74 degrees C), unless otherwise indicated, and curtain type stainless steel interlocking blades, with electric motor equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting bracket, and 32" long wire leads for connecting to smoke detector, and with the following construction features:
 - a. Unit Assembly: Motor mounted outside air stream.
 4. Manufacturer: Subject to compliance with requirements, provide fire and smoke dampers of one of the following:
 - a. Air Balance, Inc.
 - b. American Warming & Ventilating, Inc.
 - c. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
 - d. Louvers & Dampers, Inc.
 - e. Penn Ventilator Co.
 - f. Phillips-Aires
 - g. Ruskin Mfg. Co.
- C. Turning Vanes:
1. Manufactured Turning Vanes: Provide double thickness airfoil turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c, and set into side strips suitable for mounting in ductwork.
 2. Manufacturer: Subject to compliance with requirements, provide turning vanes of one of the following:
 - a. Aero Dyne Co.
 - b. Airsan Corp.
 - c. Anemostat Products Div.; Dynamics Corp. of America.
 - d. Barber-Colman Co.
 - e. Duro Dyne Corp.
 - f. Environmental Elements Corp.; Subs, Koppers Co., Inc.
 - g. Hart & Cooley Mfg. Co.
 - h. Register & Grille Mfg. Co., Inc.
 - i. Souther, Inc.
- D. Duct Hardware:
1. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
 - a. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
 - b. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
 2. Manufacturer: Subject to compliance with requirements. Provide duct hardware of one of the following:
 - a. Ventfabrics, Inc.
 - b. Young Regulator Co.
- E. Duct Access Doors:
1. General: Provide duct access doors of a size as required to service and maintain device in duct. All access doors to be a minimum of 12"x12" and to be gasketed and installed air tight. Provide on (1) access door at each control damper, humidifier, coil, fire damper, and any device that requires attention.

2. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.
 3. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:
 - a. Air Balance, Inc.
 - b. Duro Dyne Corp.
 - c. Register & Grille Mfg. Co., Inc.
 - d. Ruskin Mfg. Co.
 - e. Ventfabrics, Inc.
 - f. Zurn Industries, Inc.; Air Systems Div.
- F. Flexible Connectors:
1. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.
 2. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:
 - a. American/Elgen Co.; Energy Div.
 - b. Duro Dyne Corp.
 - c. Flexaust (The) Co.
 - d. Ventfabrics, Inc.

2.10 ACOUSTIC DUCT LINING

- A. Lining for Rectangular Metal Ducts: All ducts, where shown on the drawings, shall be lined with 1" thick hospital grade liner similar to "Permacote Linacoustic HP" fiberglass duct liner with factory-applied surface and edge coating. The liner shall meet the Life Safety Standards as established by NFPA 90A and 90B, FHC 25/50 and Limited Combustibility and the airstream surface coating should contain an immobilized, EPA-registered, anti-microbial agent so it will not support microbial growth as tested in accordance with ASTM G21 and G22. The duct liner shall conform to the requirements of ASTM C 1071 and C1104, with an NRC not less than .75 as tested per ASTM C 423 using a Type "A" mounting, and a thermal conductivity no higher than .24 at 75EF mean temperature.
- B. Material Handling and Storage: Liner shall be kept clean and dry during transportation, storage and installation. Care should be taken to protect the liner from exposure to the elements or damage from mechanical abuse.
- C. Manufacturer: Subject to compliance with the above provide duct sound lining in accordance with the above performance criteria description.

2.11 AIR OUTLETS AND INLETS

- A. Ceiling Air Diffusers:
 1. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation. Stamped face diffusers will not be acceptable.

2. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw, drop and noise criteria ratings for each size device as listed in manufacturer's current data.
 3. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
 4. Types: Provide ceiling diffusers of type, capacity, throw, blow and with accessories as listed on diffuser schedule.
 - a. Ceiling Diffusers shall be of the restricted multi-orificed jet induction and air mixing type consisting of louver sections with built-in diffusing vanes. The vanes shall be arranged to discharge air from adjacent louvers at an angle of 45 degrees in opposite directions to insure rapid mixing of primary and room air. Diffusing vanes shall be welded and mechanically fastened to the adjacent louver sections to make a rigid unit. The vanes shall extend to the discharge edges of the louvers. Where louver sections join the core frame, the louver ends shall be welded to the core frame. The leaving edge of each louver shall be hemmed and the louver ends shall be rounded and hemmed before welding to the core frames.
 - b. Diffusers shall be fabricated of aluminum or steel-welded construction, and shall be provided with a removable core permitting easy access to the neck connection. The diffuser neck shall extend no less than 1" above the core to accommodate an internal duct connection to prevent leakage into the ceiling space.
 - c. Finish shall be baked enamel. Color as selected by A/E.
 5. Diffuser Dampers:
 - a. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of diffuser. Provide in each ceiling diffuser.
 6. Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
 - a. Price
 - b. Titus
 - c. Metel Aire
- B. Wall Registers and Grilles:
1. General: Except as otherwise indicated, provide manufacturer's standard registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
 2. Performance: Provide registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
 3. Compatibility: Provide registers and grilles with border styles that are compatible with adjacent systems, and that are specifically manufactured to fit into wall and ceiling construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of construction which will contain each type of register and grille.
 4. Types: Provide registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule:
 5. Pattern: Register and grille patterns shall have style as identified on Drawings:
 6. Dampers: Opposed Blade adjustable assembly, key operated from face of register.
 7. Accessories:
 - a. Plaster Frame: Perimeter frame designed to act as plaster stop and register or grille anchor. Provide where required.
 - b. Operating Keys: Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustment.
 8. Finish: Register and Grille Finishes shall be baked enamel color as selected by the Architect.

9. Manufacturer: Subject to compliance with requirements, provide registers and grilles of one the following:
 - a. Price
 - b. Titus
 - c. Metalaire

- C. Ceiling Registers and Grilles:
 1. General: Except as otherwise indicated, provide manufacturer's standard "Egg-Crate" type registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
 2. Compatibility: Provide registers and ceiling grilles with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling construction.
 3. Types: Provide registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule.
 4. Register and Grille Materials:
 - a. Aluminum Construction: Manufacturer's standard extruded aluminum frame and core.
 5. Register and Grille Faces:
 - a. 1/2" x 1/2" "Egg-Crate" with 1" border frame.
 6. Register and Grille Dampers:
 - a. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of register (provide for registers only).
 7. Register and Grille Finishes shall be baked enamel color as selected by the Architect.
 8. Manufacturer: Subject to compliance with requirements, provide registers and grilles of one of the following:
 - a. Price
 - b. Metalaire
 - c. Titus

2.12 DUCTLESS COOLING UNITS

- A. Evaporator (Stand-Alone):
 1. General: The unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board, and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from factory.

- B. Cabinet: The casing shall be ABS plastic factory finish. Cabinet shall be designed for suspension mounting and horizontal operation. The rear cabinet panel shall have provisions for a field installed filtered outside air intake connection.

- C. Fan: The evaporator fan shall have three high performance, double inlet, forward curve fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: low, medium, and high.

- D. Vane: There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five (5) vertical airflow patterns selected by remote control. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.

- E. Filter: Return air shall be filtered by means of an easily removable washable filter.
- F. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
- G. Control: The control system shall consist of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. For A-Control, a three (3) conductor 14 ga. AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units. Where separate power is supplied to the indoor and outdoor units, a two (2) 20 ga. AWG wire shall be run between the units to provide forbid-directional control communication. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel.
- H. Condensing (Stand Alone):
 - 1. General: The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions. The outdoor unit shall be capable of operating at 0°F, (-18°C) ambient temperature with additional low ambient controls. The outdoor unit shall be able to operate with a maximum height difference of 100 feet and have maximum refrigerant tubing length of 165 feet between indoor and outdoor units without the need for line size changes, traps or additional oil. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
 - 2. Cabinet: The casing shall be constructed from galvanized steel plate, coated with a finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a factory finish. The fan grille shall be of ABS plastic.
 - 3. Fan: The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.
 - 4. Coil: The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be control by a microprocessor controlled step motor.
 - 5. Compressor: The compressor shall be a scroll compressor with variable speed inverter technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.
 - 6. Electrical: The electrical power of the unit shall be as indicated on the drawings. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

I. Variable Refrigerant Flow

1. System Description

- a. The variable capacity, heating/cooling change-over system shall be a (Variable Refrigerant Flow).
- b. Each indoor evaporative unit shall be provided with service isolation valves.
- c. The system shall consist of a outdoor unit, Controller, multiple indoor units (-E models), and DDC (Direct Digital Controls). Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. The sum of connected capacity of all indoor air handlers shall range from 50% to 130% of outdoor rated capacity.

2. Quality Assurance

- a. The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label.
- b. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- c. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- d. All units must meet or exceed the 2010 Federal minimum efficiency requirements and the proposed ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the DOE alternative test procedure, which is based on the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standards 340/360, 1230 and ISO Standard 13256-1.
- e. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

3. Delivery, Storage and Handling

- a. Unit shall be stored and handled according to the manufacturer's recommendation.

4. Warranty

- a. The units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of installation.

If the systems are:

- 1) designed by a certified equipment designer
- 2) installed by a contractor that has successfully completed the required training by the equipment manufacturer, and
- 3) verified with a completed commissioning report submitted to and approved by the equipment manufacturer, then the units shall be covered by an extended manufacturer's limited warranty for a period of five (5) years from date of installation by the equipment manufacturer.

In addition the compressor shall have a manufacturer's limited warranty for a period of seven (7) years from date of installation.

If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty shall not include labor.

- b. Manufacturer shall have a minimum of five years of HVAC experience in the U.S. market.

- c. All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.
- d. The VRF system shall be installed by a contractor with extensive equipment manufacturer install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

5. Products

Outdoor Unit

a. General:

The outdoor unit shall be used specifically with same equipment manufacturer's components. The outdoor units shall be equipped with multiple circuit boards that interface to the controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

- 1) The model nomenclature and unit requirements are shown on plans. All units requiring a factory supplied twinning kits shall be piped together in the field. If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.

Outdoor Unit Model Nomenclature Basis of Design					
		Twinning Kit	208 Volt		Twinning Kit
Model Number	Units		Model Number		
			Refer to dwgs	Refer to dwgs	

- 2) Outdoor unit shall have a sound rating no higher than 60 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 50 dB(A) individually or 53 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
- 3) Both refrigerant lines from the outdoor unit to the indoor units controller (Single or Main) shall be insulated.
- 4) Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
- 5) The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
- 6) The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.
- 7) The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-2625 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
- 8) The outdoor unit shall be capable of operating in heating mode down to -4°F ambient temperature. The outdoor unit shall be capable of operating in cooling mode with required capacity down to -0°F with manufacturer supplied low ambient kit. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
- 9) Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation automatically in all outdoor unit operation modes.

- 10) Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
 - 11) Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
 - 12) Outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
 - 13) Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend “no or reduced heating” periods shall not be allowed.
- b. Unit Cabinet:
- 1) The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Units cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models (–BS models)
- c. Fan:
- 1) Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
 - 2) All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
 - 3) All fan motors shall be mounted for quiet operation.
 - 4) All fans shall be provided with a raised guard to prevent contact with moving parts.
 - 5) The outdoor unit shall have vertical discharge airflow.
- d. Refrigerant:
- 1) R410A refrigerant shall be required for unit systems.
 - 2) Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
- e. Coil:
- 1) The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
 - 2) The coil fins shall have a factory applied corrosion resistant blue-fin finish.
 - 3) The coil shall be protected with an integral metal guard.
 - 4) Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
 - 5) The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.
- f. Compressor:
- 1) Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
 - 2) A crankcase heater(s) shall be factory mounted on the compressor(s).
 - 3) The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 19%-5% of rated capacity, depending upon unit size.
 - 4) The compressor will be equipped with an internal thermal overload.
 - 5) The compressor shall be mounted to avoid the transmission of vibration.

- 6) Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
 - g. Electrical:
 - 1) The outdoor unit electrical power shall be 208 volts, 3-phase, 60 hertz refer to mechanical schedules.
 - 2) The outdoor unit shall be controlled by integral microprocessors.
 - 3) The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
6. Branch Circuit (BC) Controllers
- 1) Each VRF system shall include at least one (1) unused branches or branch devices for future use. Branches shall be fully installed & wired in central location with capped service shutoff valve & service port.
 - b. Refrigerant:
 - 1) R410A refrigerant shall be required.
 - c. Refrigerant valves:
 - 1) The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
 - 2) Each branch shall have multiple two-position valves to control refrigerant flow.
 - 3) Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
 - 4) Linear electronic expansion valves shall be used to control the variable refrigerant flow.
 - d. Integral Drain Pan:
 - 1) An integral condensate pan and drain shall be provided.
 - e. Electrical:
 - 1) The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
 - 2) The unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253V (230V/60Hz).
 - 3) The BC Controller shall be controlled by integral microprocessors.
 - 4) The control circuit between the indoor units and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
7. Controls Network
- a. Controls Network consists of remote controllers, schedule timers, system controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The Controls Network shall support operation monitoring, scheduling, error email distribution, personal browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using BACnet[®] interfaces. The below figure illustrates a sample control network System Configuration.

8. Remote Controllers
 - a. Provide remote wired backlit controllers for all indoor evaporators.

9. Centralized Controller
 - a. Centralized Controller:
 - 1) The Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple outdoor units. The Centralized Controller shall be approximately 8-1/2"x10" in size and shall be powered from a built-in power supply to the network transmission line. The Centralized Controller shall support operation superseding that of the remote controllers, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring. The Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic control set of operation controls for the Centralized Controller shall include on/off, operation mode selection (cool, heat, auto, dry, and fan), temperature setting, fan speed setting, and airflow direction setting. Since the GB-50ADA provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the GB-50ADA Centralized Controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, vane, direction, fan speed, and permit/prohibit of remote controllers.

(Suggested Centralized Controller Settings Basis of Design)			
Item	Description	Operation	Display
ON/OFF		Each Block, Group or Collective	Each Group or Collective
Operation Mode	Switches between Cool/Dry Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent-heat/interchange/normal ventilation) Operation modes vary depending on the air conditioner unit. ULTI R2/WR2-Series only.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature for a single group. Range of temperature setting from 57°F – 87°F dependant on operation mode and indoor unit model.	Each Block, Group or Collective	Each Group
Fan Speed Setting	Models with 5 air flow speed settings: Hi/Mid-2/Mid-1/Low, Auto Models with 4 air flow speed settings: Hi/Mid-2/Mid-1/Low Models with 3 air flow speed settings: Hi/Mid/Low Models with 2 air flow speed settings: Hi/Low * Fan speed setting (including Auto) varies depending on the indoor unit model.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction angles, 4-angle or 5-angle Swing, Auto *1: Louver cannot be set. *Air flow direction settings vary depending on the indoor unit model.	*1 Each Block, Group or Collective	Each Group

(Suggested Centralized Controller Settings Basis of Design)			
Item	Description	Operation	Display
Schedule Operation	Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized startup setting is also available. *2: The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can be scheduled per day, including ON/OFF, Mode, Temperature Setting, Operation Prohibition, Vane Direction, and Fan Speed. Two types of weekly schedule (Summer/Winter) can be set. Settable items depend on the functions that a given air conditioning unit supports.	*2 Each Block, Group or Collective	Each Group
Optimized Startup	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *3: Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Indoor Unit Intake Temp	Measures the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4 When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection	N/A	*4 Each Unit or Collective
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation".	Each Group	Each Group
Interlock	Operation of indoor groups or general equipment can be interlocked by the change of state (ON/OFF, mode, error of indoor groups/general equipment). (GB-50 will execute interlocking control depending on the interlocked setting.)	N/A	N/A
Multiple Language	Other than English, the following language can be chosen. Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese are available.	N/A	N/A
External Input / Output	By using accessory cables you can set and monitor the following. Input By level: "Batch start/stop", "Batch emergency stop" By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" *5: Requires the external I/O cables (PAC-YG10HA-E) sold separately.	*5 Collective	*5 Collective

(Suggested Centralized Controller Settings Basis of Design)			
Item	Description	Operation	Display
M-Net	The "M-NET" LED lights, when AC power supply is turned ON. is communicating.	N/A	Each Group (LED)
Collective ON/OFF	All the units can be operated / stopped with a DIP switch.	Collective	Collective (7 SEG)
Data back-up (USB Memory)	The initial setting data, operation data (charge parameter) can be stored to a USB memory. Initial setting data can be read from USB memory.	N/A	N/A

- 1) All Centralized Controllers shall be equipped with one Ethernet port to support interconnection with a network PC via a closed/direct Local Area Network (LAN). The Centralized Controller shall be capable of performing initial settings via a PC using the Centralized Controller's initial setting browser.
- 2) Standard software functions shall allow the building manager to securely log into each Centralized Controller via the PC's web browser to support operation monitoring, scheduling, error email, and online maintenance diagnostics. Standard software functions shall not expire.

10. Control Network: System Integration

- a. The Control Network shall be capable of supporting integration with Building Management Systems (BMS) via our LonWorks[®] and BACnet[®] interfaces.
 - 1) BAC-HD150: BACnet[®] Interface. The Mitsubishi Electric HVAC BACnet[®] interface, BAC-HD150, shall be compliant with BACnet[®] Protocol (ANSI/ASHRAE 135-2004) and be Certified by the (BTL) BACnet[®] Testing Laboratories. The BACnet[®] interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address. HVAC contractor and ATC Contractor shall coordinate BMS system protocol requirements for integration into existing Automated Logic BMS System.

11. Manufacturers

- a. Subject to compliance with requirements, provide products by one of the following:
 - 1) Mitsubishi CityMulti
 - 2) Sanyo ECOi Variable Refrigerant Flow (VRF) System.
 - 3) Daikin AC
 - 4) Or Equal.
 - 5) Written prior approval required for alternate VRF System Manufacturer.
 - a) Written prior approved alternate manufacturer is required to coordinate any changes from the basis of design with all associated trades. Any additional costs associated with the alternate equipment shall be covered by the HVAC contractor or equipment manufacturer. No additional costs shall be incurred by the owner.
 - b) Shop drawings shall be submitted in accordance with 013300. Submittals should include equipment cutsheet information, proposed piping design layout and list of materials. Submittals shall be prepared by an authorized system designer and distributor.

2.13 CONDENSATE DISCHARGE PUMPS (Refer to various equipment schedules and drawings for locations and quantities)

- A. General: Provide where indicated, condensate pumps of capacity as scheduled, to be field installed in various air handling equipment drain pans, consisting of ABS housing, pump, check valve, safety switch, and thermal overload protection. Factory assembled unit must be UL/CSA listed.
- B. High-Capacity Pumps
 - 1. Reservoir: Construct of ABS plastic with a 3/10 capacity volume.
 - 2. Pump: 25 GPH@15TDH vertical type pump with stainless steel motor shaft, rustproof, ABS volute, with safety switch.
 - 3. Housing and Cover: Each shall be ABS plastic.
 - 4. Manufacturers: Subject to compliance with requirements, provide high-capacity condensate pump of Little Giant or approved equal:
- C. Low-Capacity Pumps
 - 1. Pump: 8 GPH@33TDH reciprocating piston pump direct discharge with no storage reservoir.
 - 2. Detection Unit: Low-maintenance filter free with a three level float (on/off/alarm).
 - 3. Pump Housing and Detection Unit: Each shall be ABS plastic.
 - 4. Manufacturers: Subject to compliance with requirements, provide low-capacity condensate pump of Sauermann or approved equal.

2.14 FIRESTOP SYSTEMS

- A. General: Provide firestopping at all fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 07 84 10 - PENETRATION FIRESTOPPING, for all product requirements for maintaining integrity of fire-rated construction at penetrations.

2.15 WALL AND CEILING ACCESS DOORS

- A. Furnish access doors for access to all concealed control valves, motor operated dampers, fire doors, etc, and all other concealed parts of the HVAC system that require accessibility for the proper operation and maintenance of the system.
- B. Access doors shall be manufactured and installed in accordance with Section 08 11 10.

2.16 AUTOMATIC TEMPERATURE CONTROLS

- A. Basic Components and Systems:
 - 1. General: Provide control products in sizes and capacities indicated, consisting of dampers, thermostats, clocks, sensors, controllers, and other components as required for completed installation. Except as otherwise indicated, provide manufacturer's standard materials and components as published in their product information, designed and constructed as recommended by manufacturer and as required for application indicated. All equipment and systems shall be installed by factory trained contractors with the following functional and construction features.

2. Electric Wiring:
 - a. All electric wiring and wiring connections, either line voltage or low voltage, from the main electric panels to the ATC panels, and from the ATC related panels to the individual control devices i.e. VAV boxes, valves, dampers, etc. required for the installation of the control system, as herein specified shall be provided by the control contractor unless specifically shown on the electrical drawings or called for in the electrical specifications. The wiring installation shall be in accordance with National and Local Codes and with the Electrical portion of these specifications. All wiring shall be run concealed wherever possible. Exposed wiring in occupied areas shall be run in raceways. Raceways shall be Wiremold 200 series with all elbows, raceways, covers, mounting stops, box extensions and wiring for a complete and neat installation. All wiring located in mechanical spaces, boiler rooms, fan rooms, etc. shall be installed in metal conduit.
 - b. All wiring above ceilings, all mechanical spaces shall follow routing of piping and where not possible shall be in conduit. All exposed wire shall be bundled and wire tied and shall be supported to adjacent piping. Draped and free floating wire will not be allowed.
 - c. All terminations of wire at control devices shall be looped and supported adequately.
 - d. All wiring shall comply with the requirements of the electrical section of the specification.
 3. The building ATC/BMS system shall be an open protocol (BACNet), web accessible and addressable direct digital control system and shall be integrated into the existing building Automated Logic BMS System.
 4. The existing system compatibility shall be coordinated with the existing ATC company in charge of BMS system. Coordinate all points, interfacing need, etc. to allow for new equipment to be monitored, controlled, etc with existing BMS.
 5. All new equipment is intended to interface with the existing BMS as outlined in the specifications, control drawings, etc. With the exception of any upgrades to the existing BMS noted in these documents, the system shall be existing to remain.
- B. Controls Systems Wiring
1. All conduit raceways, wiring, accessories and wiring connections required for the installation of the Controls Systems shall be provided by the Controls Contractor except as shown on the Electrical Trade documents. All wiring shall comply with the requirements of applicable portions of the Electrical Trade work and all local and national electric codes and the requirements of the AHJ.
 2. All Controls Systems wiring materials and installation methods shall comply with the original equipment manufacturer recommendations and standards.
 3. The sizing type and provision of cable, conduit, cable trays and raceways shall be the design responsibility of the Controls Contractor.
 4. Class 2 Wiring
 - a. All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
 - b. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5ft. from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines.
 5. Class 2 signal wiring and 24VAC power may be run in the same conduit. Power wiring 120VAC and greater shall not share the same conduit with Class 2 signal wiring.
 6. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
 - a. All circuits are continuous and free from short circuits and grounds.
 - b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms.
 - c. All circuits are free from induced voltages.
 7. Provide complete testing for all cables and wiring. Provide all equipment, tools, and personnel as necessary to conduct these tests.

8. Provide for complete grounding of all signal and communication cables, panels and equipment so as to ensure integrity of Controls Systems operation. Ground cabling and conduit at panel terminations. Do not create ground loops.
- C. Line Voltage Power Sources
1. 120-volt AC circuits for the Controls Systems shall be taken by the Controls Contractor from electrical trade panelboards and circuit breakers as designated on the electrical drawings.
 2. Circuits used for the Controls Systems shall be dedicated to these Controls Systems and shall not be used for any other services.
 3. Controls DDC terminal unit controllers may use 120-volt AC power from motor power circuits.
- D. Controls Systems Raceways
1. All wiring shall be installed in conduit or raceway except as noted elsewhere in the Specification. Minimum conduit size 3/4".
 2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
 3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the supporting surface.
 4. UL/ULC Listed Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls and for final connection to equipment.
- E. Penetrations
1. Firestopping for all penetrations used by dedicated Controls Systems conduits and raceways shall be by this contractor.
 2. All openings in fire proofed or fire stopped components shall be closed in accordance with Section 07 84 10.
 3. All wiring passing through penetrations, including walls, shall be in sleeves, conduit or enclosed raceway.
 4. No penetrations through building structural elements, slabs, ceilings and walls shall be made before receipt of written approval from the Architect.
- F. Controls Systems Identification Standards
1. Node Identification: All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node environmental location.
 2. Cable shall be labeled at every termination with cross-referencing to record documentation.
 3. Raceway Identification: Exposed covers to junction and pull boxes of the FMS raceways shall be identified at primary points.
 4. Wire Identification: All low and line voltage wiring shall be identified by a number, as referenced to the associated shop and record drawing, at each termination.
 5. Wires and cabling shall not be spliced between terminations. Cable shields shall be single end grounded – typically at the panel end outside the panel.
 6. Suggested color coding, for use at the Contractors option, are:
 - a. Analog Input Cable Yellow
 - b. Analog Output Cable Tan
 - c. Binary Input Cable Orange
 - d. Binary Output Cable Violet
 - e. 24 VAC Cable Gray
 - f. General Purpose Cable Natural
 - g. Tier 1 Comm Cable Purple
 - h. Other Tier Comm Cable Blue
- G. Field Panel And Device Installations And Locations

1. The Controls Systems panels, enclosures and cabinets shall be located as coordinated with the Architect at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer's recommendations.
 2. All field devices shall be installed per the manufacturer recommendation and in accessible locations as coordinated with the Architect.
 3. Panels to be located in damp areas or areas subject to condensation shall be mounted with wall standoffs.
 4. Conduit configurations entering or leaving panels and devices shall be such as to preclude condensation traps.
- H. Networking Communications
1. All new equipment shall be added to existing BMS.
 2. System interface of new equipment shall be by equipment manufacturer and existing ATC contractor.
- I. HVAC Mechanical Equipment Controllers
1. All mechanical equipment controls shall be coordinated between the equipment manufacturer and the existing ATC contractor for existing to remain BMS.
 2. HVAC Mechanical Equipment Controllers shall be a 12-bit stand-alone, multi-tasking, multi-user, real-time digital control processors consisting of modular hardware with plug-in enclosed processors.
 3. Each HVAC Mechanical Controller shall have 72 Megabytes of memory to support its own operating system and databases, including:
 - a. Control processes
 - b. Energy management applications
 - c. Alarm management applications including custom alarm messages for each level alarm for each point in the system.
 - d. Historical/trend data for points specified
 - e. Maintenance support applications
 - f. Custom processes
 - g. Operator I/O
 - h. Remote communications
 4. HVAC Mechanical Equipment Controllers shall provide a RS-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals.
 5. HVAC Mechanical Equipment Controllers shall provide local LED status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.
 6. Each HVAC Mechanical Equipment Controller shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all components. The HVAC Mechanical Equipment Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication.
 7. In the event of the loss of normal power, there shall be an orderly shutdown of all HVAC Mechanical Equipment Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.
 - a. Upon restoration of normal power, the HVAC Mechanical Equipment Controller shall automatically resume full operation without manual intervention.
 - b. Should HVAC Mechanical Equipment Controller memory be lost for any reason, the user shall have the capability of reloading the HVAC Mechanical Equipment Controller via the local RS-232C port, via telephone line dial-in or from a network workstation PC.

- J. DDC & HVAC Mechanical Equipment Controller Resident Software Features
1. All new equipment shall be interfaced with the existing BMS system. Coordinate with the existing ATC.
 2. General:
 - a. The software programs specified in this Section shall be provided as an integral part of DDC and HVAC Mechanical Equipment Controllers and shall not be dependent upon any higher level computer for execution.
 - b. All points shall be identified by up to 30 character point name and 16 character point descriptor. The same names shall be used at the PC workstation.
 - c. All digital points shall have user defined two-state status indication (descriptors with minimum of 8 characters allowed per state (i.e. summer/winter)).
 3. Control Software Description:
 - a. The DDC and HVAC Mechanical Equipment Controllers shall have the ability to perform the following pre-tested control algorithms:
 - 1) Two-position control
 - 2) Proportional control
 - 3) Proportional plus integral control
 - 4) Proportional, integral, plus derivative control
 - 5) Automatic tuning of control loops
 4. DDC and HVAC Mechanical Equipment Controllers shall provide the following energy management routines for the purpose of optimizing energy consumption while maintaining occupant comfort.
 - a. Start-Stop Time Optimization (SSTO) shall automatically be coordinated with event scheduling. The SSTO program shall start HVAC equipment at the latest possible time that will allow the equipment to achieve the desired zone condition by time of occupancy. The SSTO program shall also shut down HVAC equipment at the earliest possible time before the end of the occupancy period, and still maintain desired comfort conditions.
 - 1) The SSTO program shall operate in both the heating and cooling seasons.
 - a) It shall be possible to apply the SSTO program to individual fan systems.
 - b) The SSTO program shall operate on both outside weather conditions as well as inside zone conditions and empirical factors.
 - 2) The SSTO program shall meet the local code requirements for minimum outside air while the building is occupied.
 - b. Event Scheduling: Provide a comprehensive menu driven program to automatically start and stop designated points or groups of points according to a stored time.
 - 1) It shall be possible to individually command a point or group of points.
 - 2) For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start or stop within that group.
 - 3) The operator shall be able to define the following information:
 - a) Time, day
 - b) Commands such as on, off, auto, and so forth.
 - c) Time delays between successive commands.
 - d) There shall be provisions for manual overriding of each schedule by an appropriate operator.
 - 4) It shall be possible to schedule events up to one year in advance.
 - a) Scheduling shall be calendar based.
 - b) Holidays shall allow for different schedules.

- c) Enthalpy switchover (economizer) .The Energy Management Control Software (EMCS) will control the position of the air handler relief, return, and outside air dampers. If the outside air dry bulb temperature falls below changeover set point the EMCS will modulate the dampers to provide 100 percent outside air. The user will be able to quickly changeover to an economizer system based on dry bulb temperature and will be able to override the economizer cycle and return to minimum outside air operation at any time.
 - d) Temperature-compensated duty cycling.
 - e) The DCCP (Duty Cycle Control Program) shall periodically stop and start loads according to various patterns.
 - f) The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.
 - g) Automatic Daylight Savings Time Switchover: The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.
 - h) Night setback control: The system shall provide the ability to automatically adjust setpoints for night control.
 - i) The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges.
 - j) PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.
 - k) PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.
 - l) If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.
 - m) Once the demand peak has passed, loads that have been shed shall be restored and returned to normal control.
5. DDC and HVAC Mechanical Equipment Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
- a. A single process shall be able to incorporate measured or calculated data from any and all other DDC and HVAC Mechanical Equipment Controllers on the network. In addition, a single process shall be able to issue commands to points in any and all other DDC and HVAC Mechanical Equipment Controllers on the network. Database shall support 30 character, English language point names, structured for searching and logs.
 - b. Processes shall be able to generate operator messages and advisories to operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of a dial-up connection to a remote device such as a printer or pager.
 - c. DDC and HVAC Mechanical Equipment Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task orientated information from the user manual.
 - d. DDC and HVAC Mechanical Equipment Controller shall be capable of comment lines for sequence of operation explanation.
6. Alarm management shall be provided to monitor and direct alarm information to operator devices. Each DDC and HVAC Mechanical Equipment Controller shall perform distributed, independent alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost. At no time shall the DDC and HVAC Mechanical Equipment Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.

- a. All alarm or point change reports shall include the point's English language description and the time and date of occurrence.
 - b. The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of six priority levels shall be provided for each point. Point priority levels shall be combined with user definable destination categories (PC, printer, DDC Controller, etc.) to provide full flexibility in defining the handling of system alarms. Each DDC and HVAC Mechanical Equipment Controller shall automatically inhibit the reporting of selected alarms during system shutdown and start-up. Users shall have the ability to manually inhibit alarm reporting for each point.
 - c. Alarm reports and messages will be directed to a user-defined list of operator devices or PCs based on time (after hours destinations) or based on priority.
 - d. In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 200 character alarm message to more fully describe the alarm condition or direct operator response.
 - e. In dial-up applications, operator-selected alarms shall initiate a call to a remote operator device.
7. A variety of historical data collection utilities shall be provided to manually or automatically sample, store and display system data for points as specified in the I/O summary.
- a. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each DDC and HVAC Mechanical Equipment Controllers point group. Two methods of collection shall be allowed: either by a pre-defined time interval or upon a pre-defined change of value. Sample intervals of 1 minute to 7 days shall be provided. Each DDC and HVAC Mechanical Equipment Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a sufficient number of data samples. All trend data shall be available for transfer to a Workstation without manual intervention.
 - b. DDC and HVAC Mechanical Equipment Controllers shall also provide high resolution sampling capability for verification of control loop performance. Operator-initiated automatic and manual loop tuning algorithms shall be provided for operator-selected PID control loops as identified in the point I/O summary.
 - 1) Loop tuning shall be capable of being initiated either locally at the DDC and HVAC Mechanical Equipment Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.
8. DDC and HVAC Mechanical Equipment Controllers shall be capable of automatically accumulating and storing run-time hours for digital input and output points and automatically sample, calculate and store consumption totals for analog and digital pulse input type points, as specified in the point I/O schedule.
9. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to access any data from or send control commands and alarm reports directly to any other DDC and HVAC Mechanical Equipment Controller or combination of controllers on the network without dependence upon a central or intermediate processing device. DDC and HVAC Mechanical Equipment Controllers shall send alarm reports to multiple workstations without dependence upon a central or intermediate processing device. The peer to peer network shall also allow any DDC and HVAC Mechanical Equipment Controller to access, edit, modify, add, delete, back up, and restore all system point database and all programs.

10. The peer to peer network shall allow the DDC and HVAC Mechanical Equipment Controllers to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any PC workstation or portable operator terminal) shall enable the operator to monitor, adjust and control the points that the operator is authorized for. All other points shall not be displayed on the PC workstation or portable terminal (e.g. all base building and all tenant points shall be accessible to any base building operators, but only tenant points shall be accessible to tenant building operators). Passwords and priorities for every point shall be fully programmable and adjustable.
- K. Floor Level Network Application Specific Controllers (FEC)
1. Each DDC Controller shall be able to extend its performance and capacity through the use of remote application specific controllers (FECs) through Floor Level LAN Device Networks.
 2. Each FEC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each FEC shall be a microprocessor-based, multi-tasking, real-time digital control processor. Each FEC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.
 3. Terminal Equipment Controllers:
 - a. Provide for control of each piece of equipment, including, but not limited to, the following:
 - 1) Unit Heater
 - 2) DCUe/DCUc
 - 3) RTU
 - 4) Fin Tube Radiation
 - b. Controllers shall include all point inputs and outputs necessary to perform the specified control sequences. Analog outputs shall be industry standard signals such as 24V floating control, 3-15 psi pneumatic, 0-10v, allowing for interface to a variety of modulating actuators.
 - c. All controller sequences and operation shall provide closed loop control of the intended application. Closing control loops over the FLN, BLN or MLN is not acceptable
- L. Personal Computer Operator Workstation Hardware
1. All new equipment shall interface with the existing BMS platform. Equipment manufacturers must coordinate requirements with the ATC contractor for systems to function as indicated in the specification, control drawings, and any notes indicated on the floor plans. Update all existing BMS systems which are renovated as part of this project. Refer to Control Drawings.
- M. Field Devices
1. Provide instrumentation as required for monitoring, control or optimization functions.
 2. Room Temperature Sensors
 - a. Office areas shall be provided with digital room sensors shall have LCD display, day / night override button, and setpoint slide adjustment override options. T-stat style shall be approved by Owner. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment. Classroom and teaching room areas shall have day / night override button, and setpoint slide adjustment override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment. Public areas such as corridors, entry areas, vestibules, restrooms shall have chrome cover plate without adjustment or occupied/unoccupied capability. Temperature sensors located in gymnasiums and locker rooms shall be provided with tamper proof guard.

- Temperature monitoring range +20/120°F -13° to 49°C
 - Output signal Changing resistance
 - Accuracy at Calibration point $\pm 0.5^\circ\text{F}$ (+/- 0.3°C)
 - Set Point and Display Range 55° to 95° F (13° to 35°C)
- b. Liquid immersion temperature:
 - Temperature monitoring range +30/250°F (-1°/121°C)
 - Output signal Changing resistance
 - Accuracy at Calibration point $+0.5^\circ\text{F}$ (+/-0.3°C)
- c. Duct (single point) temperature:
 - Temperature monitoring range +20/120°F (-7°/49°C)
 - Output signal Changing resistance
 - Accuracy at Calibration point $+0.5^\circ\text{F}$ (+/-0.3°C)
- d. Duct Average temperature:
 - Temperature monitoring range +20° +120°F(-7°/+49°C)
 - Output signal 4 – 20 mA DC
 - Accuracy at Calibration point $+0.5^\circ\text{F}$ (+0.3°C)
 - Sensor Probe Length 25' L (7.3m)
- e. Outside air temperature:
 - Temperature monitoring range -58°+122° F(-50°C to +50°C)
 - Output signal 4 – 20 mA DC
 - Accuracy at Calibration point $+0.5^\circ\text{F}$ (+/-0.3°C)

3. Liquid Differential Pressure Transmitter

- Ranges
 - 0-5/30 inches H2O
 - 0-25/150 inches H2O
 - 0-125/750 inches H2O
- Output 4 – 20 mA DC
- Calibration Adjustments Zero and span
- Accuracy $\pm 0.2\%$ of span
- Linearity $\pm 0.1\%$ of span
- Hysteresis $\pm 0.05\%$ of span

4. Differential pressure:

- a. Unit for fluid flow proof shall be Penn P74.
 - Range 8 to 70 psi
 - Differential 3 psi
 - Maximum differential pressure 200 psi
 - Maximum pressure 325 psi

- b. Unit for air flow settings.
- Set point ranges: 0.5" WG to 1.0" WG (124.4 to 248.8 Pa)
1.0" WG to 12.0" WG (248.8 to 497.6 Pa)
5. Static pressure sensor:
- Range 0 to .5" WG (0 to 124.4 Pa)
0 to 1" WG (0 to 248.8 Pa)
0 to 2" WG (0 to 497.7 Pa)
0 to 5" WG (0 to 1.2 kPa)
0 to 10" WG (0 to 2.5 kPa)
- Output Signal 4 – 20 mA VDC
- Combined static error 0.5% full range
- Operating Temperature -40° to 175° F (-40C to 79.5°C)
6. Air Pressure Sensor:
- Range: 0 to 0.1 in. water (0 to 24.9 Pa)
0 to 0.25 in. water (0 to 63.2 Pa)
0 to 0.5 in. water (0 to 124.5 Pa)
0 to 1.0 in. water (0 to 249 Pa)
0 to 2.0 in water 90 to 498 Pa)
0 to 5.0 in. water (0 to 1.25 kPa)
0 to 10.0 in.water (0 to 2.49 kPa)
- Output signal 4 to 20 mA
- Accuracy +1.0% of full scale
7. Humidity Sensors:
- Range 0 to 100% RH
- Sensing Element Bulk Polymer
- Output Signal 4 – 20 mA DC
- Accuracy At 77°F(25°C) + 2% RH
- Humidistat:
- Range 0 to 100% RH
- Sensing Element Bulk Polymer
- Output Signal 4 – 20 mA DC
- Accuracy At 77°F(25°C) + 2% RH
8. Insertion Flow Meters (Equal to Onicon Series F-1200)
- Sensing Method Impedance Sensing
- Accuracy + 2% of Actual Reading
- Maximum Operating Pressure 400 PSI
- Output Signal 4 – 20 mA

- Bi-directional where required.
9. Pressure to Current Transducer
- | | |
|---------------|---|
| Range | 3 to 15 psig (21 to 103 kPa) or
3 to 30 psig (21 to 207 kPa) |
| Output signal | 4 – 20 mA |
| Accuracy | + 1% of full scale (+ 0.3 psig) |
10. Carbon Dioxide Sensor
- | | |
|----------|---------------|
| Range | 0 to 1500 ppm |
| Accuracy | 20+ ppm |

N. MISCELLANEOUS DEVICES

1. Thermostats
- They shall have a bi-metal sensing element capable of responding to a temperature change of one-tenth of one degree. (Provide all thermostats with limit stops to limit adjustments as required.)
 - Thermostats shall be arranged for either horizontal or vertical mounting.
 - In the vertical position thermostat shall fit on a mullion of movable partitions without overlap.
 - Mount the thermostat covers with tamper-proof socket head screws.
2. Freezestats:
- Install freezestats on each coil that mixes outside and return air and provide protection for every square foot of coil surface area with one linear foot of element per square foot of coil.
 - Upon detection of low temperature, the freezestats shall stop the associated supply fans and return the automatic dampers to their normal position close outside air dampers and open coil valve for full flow. Provide manual reset.
3. Firestats:
- Provide manual reset, fixed temperature line voltage type with a bi-metal actuated switch.
 - Switch shall have adequate rating for required load.
4. Electronic Airflow Measurement Stations and Transmitters (At Outdoor Air Duct Locations).
- Stations – each insertion station shall contain an array of velocity sensing elements and straightening vanes. The velocity sensing elements shall be of the RTD or thermistor type. The sensing elements shall be distributed across the duct cross section in a quality to provide accurate readings. The resistance to airflow through the airflow measurement station shall not exceed 0.08 inches water gage at an airflow of 2,000 fpm. Station construction shall be suitable for operation at airflow of up to 5,000 fpm over a temperature range of 40 to 120 degrees F, and accuracy shall be plus or minus 3 percent over a range of 125 to 2,500 fpm scaled to air volume. Each transmitter shall produce a linear, temperature compensated 4 to 40 mA DC, output corresponding to the required velocity pressure measurement. Provide local readout on unit.
5. Current Sensing Relay:
- Provide solid-state, adjustable, current operated relay. Provide a relay which changes switch contact state in response to an adjustable set point value of current in the monitored A/C circuit.
 - Adjust the relay switch point so that the relay responds to motor operation under load as an “on” state and so that the relay responds to an unloaded running motor as an “off” state. A motor with a broken belt is considered an unloaded motor.
 - Provide for status device for all fans and pumps.

- O. Manufacturers: Subject to compliance with requirements, provide automatic temperature controls of one of the following:
 - 1. American Energy Management (Marlborough, MA) Existing BMS
 - 2. Taco IWORX
 - 3. Johnson Controls
 - 4. Or equal

PART 3 - EXECUTION

3.1 INSTALLATION OF METERS AND GAGES

- A. Installation of Temperature Gages
 - 1. General: Install temperature gages in vertical upright position, and tilted so as to be easily read by observer standing on floor.
 - 2. Temperature Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure Cap.
- B. Installation of Pressure Gages
 - 1. General: Install pressure gages in piping tee with pressure gage located on pipe at most readable position.
 - 2. Pressure Gage Cocks: Install in piping tee with snubber. Install siphon for steam pressure gages.
 - 3. Pressure Gage Connector Plugs: Install in piping tee where indicated, located on pipe at most readable position. Secure cap.
- C. Installation of Flow Measuring Fittings
 - 1. General: Install flow measure fittings in piping systems located in accessible locations.
- D. Adjusting and Cleaning
 - 1. Adjusting: Adjust faces of meters and gages to proper angle for best visibility.
 - 2. Cleaning: Clean windows of meters and gages and factory-finished surfaces. Replace cracked or broken windows; repair any scratched or marred surfaces with manufacturer's touch-up paint.

3.2 INSTALLATION OF HANGERS & ATTACHMENTS

- A. Vibration Control and Seismic Restraint: Refer to Section 23 05 48 and drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in Section 23 05 48 and drawing VS-1, VS-2.
- B. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- C. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.
- D. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purposes of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

- E. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through the openings at the tops of inserts.
- F. Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
 - 1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
 - 2. Prevent electrolysis in support of copper tubing by the use of hangers and supports which are copper plated, or by other recognized industry methods.
 - 3. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
 - 4. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
 - 5. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
 - 6. Insulated Piping: Comply with the following installation requirements:
 - a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
 - b. Shields: For pipe sizes up to and including 4" provide heavy gage shield at each hanger point.
 - c. Saddles: For all pipe sizes over 4" provide saddle at each hanger point. Completely fill void in saddle with loose insulation.
- G. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer for loading and stresses to connected equipment.
- H. Fabricate and install anchor by welding steel shapes, plates, and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- I. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- J. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
- K. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.
- L. Adjusting and Cleaning:
 - 1. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.

2. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
3. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.3 INSTALLATION OF MECHANICAL IDENTIFICATION

- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces; install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. General: Install pipe markers of the following type on each system indicated to receive identification, and include arrows to show normal direction of flow:
 1. Plastic pipe markers, with application system as indicated. Install on pipe insulation segment where required for hot non-insulated pipes.
- C. Locate pipe markers and color bands as follows wherever piping is in or above occupied spaces or corridors, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
 1. Near each valve and control device.
 2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
 3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
 4. At access doors, manholes and similar access points which permit view of concealed piping.
 5. Near major equipment items and other points of origination and termination.
 6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
 7. On piping above removable acoustical ceilings.
- D. Valve Identification:
 1. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.
 2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.
- E. Mechanical Equipment Identification:
 1. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device.
 2. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2' - 0", 1/2" high for distances up to 6' - 0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.
- F. Adjusting and Cleaning:
 1. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
 2. Cleaning: Clean face of identification devices, and glass frames of valve charts.

3.4 INSTALLATION OF MECHANICAL INSULATION

- A. Installation of Ductwork Insulation:
1. General: Do not insulate ductwork until ductwork has been sealed successfully, pressure tested, and approved for application of insulation by engineer or commissioning agent. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
 2. Install insulation materials with smooth and even surfaces.
 3. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
 4. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
 5. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.
 6. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.
- B. Installation of Equipment Insulation:
1. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
 2. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gaping joints and excessive voids resulting from poor workmanship.
 3. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.
 4. Do not apply insulation to equipment, breechings, or stacks while hot.
 5. Apply insulation using the staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
 6. Coat insulated surfaces with layers of insulating cement, troweled in workmanlike manner, leaving a smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.
 7. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.
 8. Do not insulate boiler manholes, handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruption of insulation.
 9. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames and accessories.
- C. Protection and Replacement:
1. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
 2. Protection; Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.5 INSTALLATION OF HYDRONIC PIPING AND ACCESSORIES

- A. Field Quality Control:
1. Preparation for Testing: Prepare hydronic piping in accordance with ASME B 31.9 and as follows:
 - a. Leave joints including welds uninsulated and exposed for examination during the test.

- b. Provide temporary restraints for expansion joints which cannot sustain the reactions due to test pressure. If temporary restraints are not practical, isolate expansion joints from testing.
 - c. Flush system with clean water. Clean strainers.
 - d. Isolate equipment that is not to be subjected to the test pressure from the piping. If a valve is used to isolate the equipment, its closure shall be capable of sealing against the test pressure without damage to the valve. Flanged joints at which blinds are inserted to isolate equipment need not be tested.
 - e. Install relief valve set at a pressure no more than 1/3 higher than the test pressure, to protect against damage by expansion of liquid or other source of overpressure during the test.
- B. Condensate piping mains shall be run in attic space. Horizontal condensate piping runs shall be pitched minimum 1/8"=1'-0" toward the discharge. Cleanouts shall be provided in the condensate piping.
- C. Pipe Applications:
- 1. Copper Tubing: Use Type L, drawn copper tubing with wrought copper fittings and solder joints for 2" and smaller, above ground, within building. Heating hot water supply and return piping.
 - 2. PVC: Use PVC on condensate piping. 1/4" Clear PVC flexible piping shall be installed from condensate pumps to condensate mains. Condensate mains shall schedule 40 PVC. Connect in accordance with all of the manufacturer's recommendations.

3.6 INSTALLATION OF REFRIGERANT PIPING AND ACCESSORIES

- A. Vibration Control and Seismic Restraint: Refer to Section 23 05 48 and drawing VS-1 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in section 23 05 48 and drawing VS-1, VS-2.
- B. Piping Installations:
- 1. Locations and Arrangements: Drawings indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, and other design consideration. So far as practical, install piping as indicated.
 - 2. Install pipe sleeves at all wall and floor penetrations.
 - 3. Install escutcheons at all exposed pipe wall penetrations.

3.7 INSTALLATION OF ROOFTOP UNITS

- A. Vibration Control and Seismic Restraint: Refer to section 23 05 48 and drawing VS-1, VS-2 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in 23 05 48 and drawing VS-1, VS-2.
- B. General: Install rooftop units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.
- C. Support: The roofing contractor shall install and secure roof curb to roof dunnage provided by structural, per details on the drawings and in accordance with National Roofing Contractors Association (NRCA) installation recommendations and shop drawings. Install and secure rooftop units on curbs and coordinate roof penetrations and flashing.

- D. Electrical Connections: Refer to electrical sections for final connections to equipment and installation of loose shipped electrical components.
- E. FACTORY TESTING
 - 1. Factory Test: Air volume and total static test shall verify that the air volume is within the range of 100% to 110% of scheduled nominal CFM requirements when operating at design total static pressure. The test for airflow and static capability shall include airflow measuring devices installed in all ducts returning to or leaving the unit. These devices shall be installed in accordance with the measuring device manufacturer's recommendations. Pressures external to the unit shall be simulated using a combination of ducts and dampers. The tests shall prove design airflow and static capability of the complete assembled unit.
 - 2. Factory Test Vibration: Each individual fan shall be tested for vibration in X-Y-Z directions at the manufacturer's facility before shipment to the unit manufacturer to assure that specified fan balancing criteria is adhered to.
- F. Field Testing
 - 1. Field Pressure Test: Contractor shall perform pressurized leak testing in the field after assembly of the any field connected units which were shipped slit. Units shall be tested at 110% unit design conditions. The contractor and unit manufacturer shall correct and/or pay for the repair of all deficiencies found during testing. The contractor shall provide all field labor necessary to join the unit sections, including all electric and drain splits after they are delivered to the site and set in place. All field work shall be provided under the direct supervision of a qualified engineer employed by the unit manufacturer. Rigging for unit sections shall be provided by the contractor.
 - 2. Test all Drain Pans Drain Pans
 - a. Check drain trap for seal
 - b. Plug pan
 - c. Flood drain pans with water to near top of drain pan
 - d. Pull plug with fan operating
 - e. Acceptable results:
 - 1) Shall drain completely in 3 minutes or less
 - 2) Trap seal still functional
 - 3) After three minutes NO puddles deeper than 3 mm shall remain in the pan.
- G. Field Piping
 - 1. HVAC Contractor shall complete all RTU inter-connection refrigerant piping between ship splits and remote located air cooled condensing section and unit refrigeration system in accordance with the manufacturer's written instructions.
 - 2. All control valves furnished and shipped loose by the RTU manufacturer shall be installed by the HVAC contractor and wiring by the ATC contractor.
 - 3. All field installed refrigeration piping shall be tested and cleaned per manufacturers instruction prior to charging.
- H. Start-Up Services:
 - 1. Provide the services of a factory-authorized service representative to start-up rooftop units, in accordance with manufacturer's written start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- I. Operating and Maintenance Training:
 - 1. Provide services of manufacturer's service representative to instruct Owner's personnel in operation and maintenance of rooftop units. Training shall include start-up and shut-down, servicing and preventative maintenance schedule and procedures, and troubleshooting procedures plus procedures for obtaining repair parts and technical assistance.
 - 2. Schedule training with Owner, provide at least 7-day prior notice to the Architect/Engineer.

- a. Provide a minimum of (1) set of spare filters for all unit filter sections and (1) set of belts for all fans. Spare filter set shall not include filter change required after testing and balancing and building flush-out procedures.

3.8 INSTALLATION OF METAL DUCTWORK

- A. Installation of Metal Ductwork:
 1. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately with internal surface smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.
 2. Sealing: All ductwork joints and seams shall be sealed with flexible duct sealer to assure an airtight installation.
 3. Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.
 - a. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.
 4. Coordination: Coordinate duct installation with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
 5. Installation: Install metal ductwork in accordance with "SMACNA HVAC Duct Construction Standards".
- B. Installation of Duct Liners:
 1. General Install duct liners in accordance with SMACNA "HVAC Duct Construction Standards".
- C. Installation of Flexible Ducts:
 1. Maximum Length: For any duct run using flexible ductwork, do not exceed 4'-0" extended length.
 2. Installation: Install in accordance with Section II of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".
- D. Field Quality Control:
 1. Leakage Tests: After each duct system, which is constructed for duct classes over 3" is completed, test for duct leakage in accordance with SMACNA "HVAC Air Duct Leakage Test Manual". Repair leaks and repeat tests until total leakage is less than 1% of system design air flow.
- E. Equipment Connections:
 1. General: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery.
- F. Adjusting and Cleaning:
 1. Duct cleaning must comply with SMACNA duct cleanliness guidelines advanced levels.
 2. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until final connections are to be completed.

3. Balancing: Refer to Division 23 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork. Seal any leaks in ductwork that become apparent in balancing process.

3.9 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90 degree elbows in supply, return, and exhaust air systems, and elsewhere as indicated.
- C. Install splitter damper with adjusting rod in each supply branch. Install according to detail on drawings.
- D. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- E. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.
- F. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.
- G. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- H. Furnish extra fusible links to owner, one link for every 10 installed of each temperature range; obtain receipt.

3.10 INSTALLATION OF ACOUSTIC DUCT LINING

- A. Installation: All portions of duct designed to receive duct liner shall be completely covered. The smooth, black coated surfaces shall face the airstream. All liners shall be cut to assure tight, overlapped corner joints. The top pieces shall be supported by the side pieces. The liner shall be adhered to the sheet metal with full coverage of an approved adhesive that conforms to ASTM C 916, and all exposed leading edges and transverse joints shall be coated with Permacote factory-applied or field-applied edge coating and shall be neatly butted without gaps. Shop or field cuts shall be liberally coated with "Schuller SuperSeal Edge Treatment" or approved adhesive. The liner shall be additionally secured with mechanical fasteners. The pin length should be such as to hold the material firmly in place with minimum compression of the material.
- B. Acoustical duct lining shall be limited to new ductwork and not required in ductwork existing to remain.

3.11 INSTALLATION OF AIR OUTLETS AND INLETS

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

3.12 INSTALLATION OF DUCTLESS COOLING UNIT SYSTEMS

- A. VIBRATION CONTROL AND SEISMIC RESTRAINT: Refer to section 23 05 48 and drawing VS-1, VS-2 for the appropriate support of each piece of HVAC equipment noted as requiring such. The vibration control and seismic restraint manufacturer shall recommend the correct connection and device as outlined in section 23 05 48 and drawing VS-1, VS-2.
- B. GENERAL:
 - 1. Verify all dimensions by field measurements. Verify roof structure, mounting supports, wall structure, and membrane installations are completed to the proper point to allow installation of wall mounted and roof mounted units. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation. Do not proceed until unsatisfactory conditions have been corrected.
 - 2. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.
- C. FIELD QUALITY CONTROL:
 - 1. Provide the services, to include a written report, of a factory authorized service representative to examine the field assembly of the components, installation, and piping and electrical connections.
 - 2. Charge systems with refrigerant and oil, and test for leaks. Repair leaks and replace lost refrigerant and oil.
- D. DEMONSTRATION:
 - 1. Provide the services of a factory authorized service representative to provide start-up service and to demonstrate and train the Owner's maintenance personnel as specified below.
 - 2. Start-up service: Place units into operation and adjust controls and safeties. Replace damaged or malfunctioning components and controls.
- E. TRAINING:
 - 1. Train the Owner's maintenance personnel on start-up and shut-down procedures, troubleshooting procedures, and servicing and preventative maintenance schedules and procedures.
 - 2. Schedule training with Owner through the Architect/Engineer with at least 7 days prior notice.

3.13 INSTALLATION OF CONDENSATE DISCHARGE PUMPS

- A. Examine areas and conditions under which pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- B. Installation of Equipment:
 - 1. General: Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in drain pans and locations indicated, and maintain manufacturer's recommended clearances in accessible locations for easy servicing and inspection.
 - 2. Accessories: Install equipment accessories not installed at factory.
 - 3. Connections: Connect discharge piping as indicated and terminate where indicated on the contract documents.
 - 4. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical installer.

- a. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- C. If condensate pump shall fail, the unit shall de-energize the associated indoor evaporating unit.
- D. Field Quality Control
 1. General: Start-up equipment, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
- E. Closeout Procedures
 1. Training: Instruct Owner's personnel in operation and maintenance of condensate discharge pumps.

3.14 INSTALLATION OF FIRESTOP SYSTEMS

- A. General: Install firestop systems at all fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 07 84 10 – PENETRATION FIRESTOPPING, for all installation requirements for maintaining integrity of fire-rated construction at penetrations.

3.15 INSTALLATION OF WALL AND CEILING ACCESS DOORS

- A. General: Install access doors in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Access doors shall be manufactured and installed in accordance with Section 08 11 10.

3.16 AUTOMATIC TEMPERATURE CONTROLS (DDC)

- A. INSTALLATION OF AUTOMATIC TEMPERATURE CONTROLS (DDC):
 1. Installation of Control Systems:
 - a. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
 - b. Control Wiring: Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code.
 - 1) Install circuits over 25-volt with color-coded No. 12 wire in electric metallic tubing.
 - 2) Install circuits under 25-volt with color-code No. 18 wire with 0.031" high temperature 105° F. (41° C) plastic insulation on each conductor and plastic sheath over all.
 - 3) Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.
 - 4) Install low voltage circuits, located in concrete slabs, masonry walls, or in mechanical areas, in electrical conduit. Where exposed in occupied areas install all wiring in wiremold.
 - 5) Power sources from lighting circuits and wall outlets shall not be used to power DDC controllers.
 - c. Controllers and safety devices:

- 1) All safety devices such as freezestats, duct mounted heat detectors, smoke detectors, etc., shall be hard wired to shut down the fans independently. Provide audible alarm with silence switch as well as DDC indication.
 - 2) Humidifier controls shall be hard wired through fan proof flow differential switch and starter auxiliary contacts to disable humidifier system on fan shutdown. Provide DDC indication.
 - 3) All supply, return and exhaust fans shall be provided with pressure differential switches. Current sensing devices, starter auxiliary contacts, and relay contacts are unacceptable proof of fan operation.
 - 4) Primary and standby pumps shall be selectable through the DDC control system. Provide local pilot light to indicate selected pump as well as alarm and silence switch for failed pump. Provide differential pressure switch to prove flow.
2. Adjusting and Cleaning:
- a. Start-Up: Start-up, test, and adjust DDC control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
 - b. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
 - c. Final Adjustment: After completion of installation, adjust thermostats, control valves, motor and similar equipment provided as work of this section.
 - 1) Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.
3. CLOSEOUT PROCEDURES:
- a. Owner's Instructions: Provide services of manufacturer's technical representative for 40 hours of onsite instruction on running and basic troubleshooting of DDC control system.
 - b. Validation: The automatic temperature control contractor shall completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequence of operation submitted.
 - 1) Witnessed validation demonstration shall consist of:
 - a) Execute digital and analog commands in English and graphic mode.
 - b) Demonstrate all specified diagnostics.
 - c) Demonstrate scan, update, and alarm responsiveness.
 - c. Training:
 - 1) All training shall be by the automatic temperature control contractor and shall utilize specified manuals and as-built documentation.
 - 2) Operator training shall include:
 - a) Sequence of Operation review.
 - b) Sign on-Sign off.
 - c) Modifying warning limits, alarm limits and start-stop times.
 - d) System initialization.
 - e) Use of Portable Operators Terminal.
 - f) Troubleshooting of sensors (determining bad sensors).
 - g) Point disable/enable.
 - h) Software review of Sequence of Operation programs.
 - i) Modification of control programs.
 - j) Add/Delete/Modify data points.
 - k) Use of diagnostics.
 - l) Review of initialization.
 - 3) Training shall be for Owner-designated personnel at the subject site, and shall be scheduled by the Owner with two week notice.

3.17 TESTING, ADJUSTING, AND BALANCING

A. REQUIREMENTS:

1. Requirements include verification of HVAC system operation, measurement of all system capacity, and establishment of the quantities of the mechanical systems as required to meet specifications, and recording and reporting the results.
2. The entire project is considered phased construction, and as such, as each phase of construction is completed the appropriate balancing for that phase of work shall be completed. At the completion of all phases of construction each previous phase of completed balancing must be re-checked and re-adjusted accordingly to match final design conditions. A preliminary report of each phase of construction will be submitted for approval during each phase of construction, and a final balancing report including all phases of construction will be submitted at the completion of the project.
3. Commission, test, adjust and balance the following mechanical systems:
 - a. Supply air systems.
 - b. Return air systems.
 - c. Outside air systems.
 - d. Verify temperature control system operation.

B. REPORT:

1. Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary.
 - b. Air Systems.
 - c. Hydronic heating and cooling systems.
 - d. Temperature Control Systems.
2. Contents: Provide the following minimum information, forms and data:
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.
 - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system.
 - c. Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

C. QUALITY ASSURANCE:

1. An independent testing, adjusting, and balancing agency certified by the AABC or NEBB as a Test and Balance Engineer in those testing and balancing disciplines required for this project.
2. Codes and Standards:
 - a. AABC: "National Standards For Total System Balance".
 - b. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

3. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and Mechanical Contractor. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.
4. System Operation: Systems shall be fully operational prior to beginning procedures. All new automatic temperature controls shall be fully operational. Test, adjust and balance the air systems before refrigerant systems. Test, adjust and balance air conditioning systems during summer season, and heating systems during winter season, including at least a period of operation at outside conditions within 5E F. wet bulb temperature of maximum summer design condition, and within 10E F. dry bulb temperature of minimum winter design condition. Take final temperature reading during seasonal operation.

D. PRELIMINARY PROCEDURES:

1. Air Systems:
 - a. Obtain drawings and become thoroughly acquainted with the systems.
 - b. Compare drawings to installed equipment and field installations.
 - c. Walk the system from the system air handling equipment to terminal units to determine variations in installation.
 - d. Check filters for cleanliness.
 - e. Check all dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
 - f. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross check with required fan volumes.
 - g. Determine best locations in main and branch ductwork for most accurate duct traverses. Traverses shall be performed in each supply and return duct main and sub-mains for each AHU and return air fan.
 - h. Place outlet dampers in the full open position.
 - i. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
 - j. Verify lubrication of all motors and bearings.
 - k. Check fan belt tension.
 - l. Check fan rotation.
2. Hydronic Systems:
 - a. Open valves to full open position. Close coil bypass valves.
 - b. Remove and clean all strainers.
 - c. Examine hydronic systems and determine if water has been treated and cleaned.
 - d. Check pump rotation.
 - e. Check expansion tanks to verify noted air pressure and that the system is completely full of water.
 - f. Check air vents at high points of system and determine if all are installed and operating freely.
 - g. Set temperature controls so all coils are calling for full flow.
 - h. Check operation of automatic bypass valves.
 - i. Check and set operating temperatures of chillers, boilers, and heat exchangers to design requirements.
 - j. Verify lubrication of all motors and bearings.
3. Measurements:
 - a. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerance specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
 - b. Provide instruments meeting the specifications of the referenced standards.

- c. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
 - d. Apply instrument as recommended by the manufacturer.
 - e. Use instruments with minimum scale and maximum subdivisions and with scaled ranges proper for the value being measured.
 - f. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
 - g. Take all reading with the eye at the level of the indicated value to prevent parallax.
 - h. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
 - i. Take measurements in the system where best suited to the task.
- E. Performing Testing, Adjusting, and Balancing:
- 1. Test, adjust and balance all noted systems according to SMACNA standards and as follows:
 - a. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
 - b. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.
 - c. Patch insulation, ductwork, and housings, using materials identical to those removed.
 - d. Seal ducts and test for and repair leaks.
 - e. Seal insulation to re-establish integrity of the vapor barrier.
 - f. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
 - g. Retest, adjust and balance system subsequent to significant system modifications, and resubmit test results.
 - 2. System Deficiencies:
 - a. The Balancing Contractor shall advise the Mechanical Contractor and the Engineer of all system deficiencies in writing. Report all motors not running, missing dampers, inoperative valves and controls, lack of access, etc.
 - b. Upon completion of system deficiencies, Balancing Contractor shall balance and record data.

3.18 EXISTING EQUIPMENT CLEANING PROCEDURES

- A. EQUIPMENT CLEANING PROCEDURES (Existing Convectors, Fintube Radiation, and Radiators)
- 1. Equipment: All HVAC equipment (coils, casings, etc.) shall be air power cleaned with a minimum of 200 psi compressed air. Upon completion of air cleaning all equipment shall be power washed with a high pressure low volume solution containing a biodegradable concentrated cleaner, disinfectant, fungicide and odor eliminator. All detergents and products must be EPA registered.
 - 2. Coils: Inspect coils to assure cleanliness and unobstructed air flow and check for corrosion, rust or defective components. Inspect interior of unit casing. Record any deficiencies and forward in report form to the engineer for review and direction.

END OF SECTION

SECTION 23 05 48 - VIBRATION CONTROL AND SEISMIC RESTRAINT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General: The work noted within section 23 05 48 is referenced by division 21 00 00, 23 00 00, 26 00 00. Provide all necessary labor & material in each division as required herein.
- B. Intent:
1. All mechanical equipment, piping, and ductwork shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
 2. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
 3. It is the intent of the seismic portion of this specification to keep all mechanical and electrical building system components in place during a seismic event.
 4. All such systems must be installed in strict accordance with seismic codes, component manufacturer's, and building construction standards. Whenever a conflict occurs between the manufacturer's or construction standards, the most stringent shall apply.
 5. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent, national, state or local construction requirements (i.e. California Title 24, California OSHPD, Canadian Building Codes, or other requirements).
 6. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.
- C. The work in this section includes, but is not limited to the following:
1. Vibration isolation for piping, ductwork and equipment.
 2. Equipment isolation bases.
 3. Flexible piping connections.
 4. Seismic restraints for isolated equipment.
 5. Seismic restraints for non-isolated equipment.
 6. Certification of seismic restraint designs and installation supervision.
 7. Certification of seismic attachment of housekeeping pads.
 8. All mechanical and electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included. Equipment referred to below is typical. (Equipment not listed is still included in this specification).

AC Units	Generators
Air Cooled Condensing Units	Heat Exchangers
Air Handling Units	Light Fixtures
Air Separators	Motor Control Ctrs
Battery Racks	Piping
Boilers	Pumps (all types)
Bus Ducts	Rooftop Units
Cable Trays	Switching Gear
Chillers	Tanks (all types)
Comp. Room Units	Transformers
Conduit	Unit Heaters
Cooling Towers	Unit Substations
Ductwork	Var. Freq. Drives

Dust Collectors
Electrical Panels
Fans (all types)

VAV Boxes
Water Heaters

D. Definitions:

1. Life Safety Systems
 - a. All systems involved with fire protection including sprinkler piping, fire pumps, jockey pumps, fire pump control panels, service water supply piping, water tanks, fire dampers and smoke exhaust systems.
 - b. All systems involved with and/or connected to emergency power supply including all generators, transfer switches, transformers, and all flowpaths to fire protection and/or emergency lighting systems.
 - c. All medical and life support systems.
 - d. Fresh air and relief systems on emergency control sequence including air handlers, conduit, duct, dampers, etc.
2. Positive Attachment
 - a. A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection, electrical conduit, bus duct, or cable trays, etc. are not acceptable as seismic anchor points.
3. Transverse Bracing
 - a. Restraint(s) applied to limit motion perpendicular to the centerline of the pipe, duct or conduit.
4. Longitudinal Bracing
 - a. Restraint(s) applied to limit motion parallel to the centerline of the pipe, duct or conduit.

1.2 SUBMITTAL DATA REQUIREMENTS

- A. In addition to requirements of Section 013300, the manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:
 1. Descriptive Data
 - a. Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
 - b. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
 2. Shop Drawings
 - a. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
 - b. Provide all details of suspension and support for ceiling hung equipment.
 - c. Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
 - d. Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
 3. Seismic Certification and Analysis
 - a. Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
 - b. All restraining devices shall have a pre-approval number from California OSHPD or some other recognized government agency showing maximum restraint ratings.

Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 450 to the weakest mode.

- c. Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embodiment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces required acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

1.3 CODE AND STANDARDS REQUIREMENTS

- A. Typical Applicable Codes, Standards, and Categories:
 - 1. International Building Code 2009 with an effective peak acceleration coefficient of 0.15.
 - 2. Massachusetts State Building Code, Eighth Edition.
 - 3. Seismic hazard exposure group of I, II, III and seismic performance category of C, D.

1.4 MANUFACTURER'S RESPONSIBILITY

- A. Manufacturer of vibration isolation and seismic control equipment shall have the following responsibilities:
 - 1. Determine vibration isolation and seismic restraint sizes and locations.
 - 2. Provide vibration isolation and seismic restraints.
 - 3. Provide calculations and materials if required for restraint of un-isolated equipment.
 - 4. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.

1.5 RELATED WORK

- A. Housekeeping Pads:
 - 1. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt coverage and embodiment.
- B. Supplementary Support Steel:
 - 1. Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment.
- C. Attachments:
 - 1. Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.

1.6 DESIGN REQUIREMENTS

- A. Design isolators for equipment installed outdoors to provide adequate restraint to withstand the force of a 100 mph wind applied to any exposed surface of the isolated equipment. Isolators for outdoor equipment shall have bolt holes for attachment to equipment and to supports. The vibration isolation Vendor shall submit verifying shear and over turning calculations, for their product and equipment installation arrangement, stamped by a licensed Professional Engineer. The design and

supply of miscellaneous support steel above and below isolators will not be the responsibility of the vibration isolation manufacturer.

1.7 QUALITY ASSURANCE

- A. Coordinate the size, location, and special requirements of vibration isolation equipment and systems with other trades. Coordinate plan dimensions with size of housekeeping pads.
- B. Provide vibration isolators of the appropriate sizes, with the proper loading to meet the specified deflection requirements.
- C. Supply and install any incidental materials such as mounting brackets, attachments and other accessories as may be needed to meet the requirements stated herein, even if not expressly specified or shown on the drawings, without claim for additional payment.
- D. Verify correctness of equipment model numbers and conformance of each component with manufacturer's specifications.
- E. Should any rotating equipment cause excessive noise or vibration when properly installed on the specified isolators, the Contractor shall be responsible for rebalancing, realignment, or other remedial work required to reduce noise and vibration levels. Excessive is defined as exceeding the manufacturer's specifications for the unit in question.

PART 2 - PRODUCTS

2.1 INTENT

- A. All vibration isolators and seismic restraints described in this section shall be the product of a single manufacturer. Mason Industry's products are the basis of these specifications; products of other manufacturers are acceptable provided their systems strictly comply with the specification.
- B. For the purposes of this project, failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8 inch and/or horizontal permanent deformation greater than 1/4 inch.

2.2 PRODUCT DESCRIPTIONS

- A. Vibration Isolators and Seismic Restraints.
 - 1. GENERAL:
 - a. All metal parts installed out-of-doors shall be corrosion resistant after fabrication. Galvanizing shall meet ASTM Salt Spray Test Standards and Federal Test Standard No. 14.
 - b. Isolators installed out-of-doors shall have base plates with bolt holes for fastening the isolators to the support members.
 - c. Isolator types are scheduled to establish minimum standards. At the Contractor's option, labor-saving accessories can be an integral part of isolators supplied to provide initial lift of equipment to operating height, hold piping at fixed elevations during installation and initial system filling operations, and similar installation advantages. Accessories and seismic restraint features must not degrade the isolation performance of the isolators.
 - d. Static deflection of isolators shall be as provided in the EXECUTION section and as shown on the drawings. All static deflections stated are the minimum acceptable

- e. deflection for the mounts under actual load. Isolators selected solely on the basis of rated deflections are not acceptable and will be disapproved.
2. SPECIFICATION:
- a. Two layers of 3/4" thick neoprene pad consisting of 2" square waffle modules separated horizontally by a 1 6 gauge galvanized shim. Load distribution plates shall be used as required. Pads shall be Type Super "W" as manufactured by Mason Industries, Inc.
 - b. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall have an Anchorage Pre-approval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Mountings shall be Type BR as manufactured by Mason Industries, Inc.
 - c. Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality. Bushing assemblies shall be type PB as manufactured by Mason Industries, Inc.
 - d. A one (1) piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal to metal contact. Neoprene bushings shall be type HG as manufactured by Mason Industries, Inc.
 - e. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height. Mountings shall be Type SLF as manufactured by Mason Industries, Inc.
 - f. Restrained spring mountings shall have an SLF mounting as described in Specification 5, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces. Mountings shall have Anchorage Pre-approval "R" Number from OSHPD in the state of California certifying the maximum certified horizontal and vertical load ratings. Mountings shall be SLR as manufactured by Mason Industries, Inc.
 - g. Spring mountings as in specification 5 built into ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4 inch travel in all directions before contacting the resilient snubbing collars. Mountings shall have an Anchorage Pre-approval "R" number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Mountings shall be SSLFH as manufactured by Mason Industries, Inc.

- h. Air Springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall be multiple bellows to achieve a maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus 1/8". Submittals shall include natural frequency, load and damping tests performed by an independent lab or acoustician. Air Springs shall be Type MT and leveling valves Type LV as manufactured by Mason Industries, Inc.
- i. Restrained air spring mountings shall have an MT air spring as described in Specification 8, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to resist all seismic forces. Mountings shall be SLR-MT as manufactured by Mason Industries, Inc.
- j. Hangers shall consist of rigid steel frames containing minimum 1 1/4" thick neoprene elements at the top and a steel spring with general characteristics as in specification 5 seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30° arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30° capability. Hangers shall be type 30° as manufactured by Mason Industries, Inc.
- k. Hangers shall be as described in specifications 10, but they shall be pre-compressed and locked at the rated deflection by means of a resilient seismic upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30° capability. Hangers shall be type PC30N as manufactured by Mason Industries, Inc.
- l. Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable assemblies shall have an Anchorage Pre-approval "R" Number from OSHPD in the State of California verifying the maximum certified load ratings. Cable assemblies shall be Type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod nut and the clevis or SCBV if clamped to a beam all as manufactured by Mason Industries, Inc.
- m. Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment. Seismic solid brace assembly shall have anchorage pre-approval "R" number from OSHPD in the state of California verifying the maximum certified load ratings. Solid seismic brace assemblies shall be type SSB as manufactured by Mason Industries, Inc.

- Note: Specifications 12 - 14 apply to trapeze as well as clevis hanger locations. At trapeze anchor locations piping must be shackled to the trapeze. Specifications apply to hanging equipment as well.
- n. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an Anchorage Pre-approval "R" Number from OSHPD in the State of California. Rod clamp assemblies shall be Type SRC as manufactured by Mason Industries, Inc.
 - o. Pipe clevis cross bolt braces are required in all restraint locations. They shall be special purpose performed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall have an Anchorage Pre-approval "R" Number from OSHPD in the State of California. Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.
 - p. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. Rated loading shall not exceed 1,000 psi. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated. Snubbers shall have an Anchorage Pre-approval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings. Snubber shall be Type Z-1 225 as manufactured by Mason Industries, Inc.
 - q. All directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications. Elastomeric materials shall be replaceable and a minimum of 3/4" thick. Rated loadings shall not exceed 1,000 psi. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" nor more than 1/4". Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at 3/8" deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable "G" force. Submittals shall include the load deflection curves up to 1/2" deflection in the x, y and z planes. Snubbers shall have an anchorage pre-approval "R" number from OSHPD in the state of California verifying the maximum certified horizontal and vertical load ratings. Snubbers shall be series Z-101 1 as manufactured by Mason Industries, Inc.
 - r. Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is "rolled up" to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying its allowable loads. Drill-in stud wedge anchors shall be type SAS as manufactured by Mason Industries, Inc.
 - s. Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedge anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying to its allowable loads. Drill-in female wedge anchors shall be type SAB as manufactured by Mason Industries, Inc.
 - t. Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14' provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer.

- Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1 ". Bases shall be type WF as manufactured by Mason Industries, Inc.
- u. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Bases shall be a minimum of 1/1 2 of the longest dimension of the base but not less than 6". The base depth need not exceed 1 2" unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place on 6" centers running both ways in a layer 1 1/2" above the bottom. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1 " clearance below the base. Wooden formed bases leaving a concrete rather than a steel finish are not acceptable. Base shall be type BMK or K as manufactured by Mason Industries, Inc.
3. Roof Curb (by HVAC Contractor)
- a. Curb mounted rooftop equipment shall be mounted on structural spring isolation curbs that bear directly on the roof support structure, and are flashed and waterproofed into the roof's membrane waterproofing system. All spring locations shall have removable waterproof covers to allow for spring adjustment and/or removal. Springs shall be Type A.
 - b. Unit shall be provided with wood nailer and flashing.
 - c. Curbs shall meet all NRCA Standards.
 - d. Curbs shall be similar to Novia Associates VibCurb III or equal having a minimum 3" rated static deflection or approved equal.
 - e. Vibration control: The spring roof curb shall have the top isolated or floating rail attached in a manner to the fixed lower portion of the curb without short circuiting or bridging between the two. Restraining bolt(s) or threaded rod shall be of sufficient size to withstand the applied wind & or seismic forces at each spring pack location.
 - f. An alignment bolt shall be installed before connecting the floating to non-floating parts to guarantee perfect centering of the restraining bolts.
 - g. Weather proofing & air seal: The spring curb must keep the weather (air and water) out and any airflow from the RTU in. The weather seal must not have the ability to fail and allow water or air into the building.
 - h. The use of exposed exterior neoprene or some other elastomer material to seal the top floating rail from the base of the curb in not acceptable.
 - i. Vibration Mountings: Provide a rubber gasket covered by formed galvanized sheet metal top flashing that overhangs the top wood nailer and galvanized bottom flashing. The overlapping shall effectively cover the rubber gasket so it is protected from the elements.
 - j. The top flashing / support rail shall be 14 ga. G60-Zc steel formed with 90 bends that extend down to the wood nailer. Provide a counter flashing member with a sponge gasket attached that presses up against the horizontal bend. The seal shall be replaceable, protected from the elements and easy to install.
 - k. Curb side material: Provide 12 Ga. G60 galvanized steel for curb side construction. All side and end seam between sheets shall be continuously welded, corner joints to be caulked and bolted.
 - l. Structural Capability:
 - 1) Curbs shall be installed on metal decking/concrete slab. Air handling unit load shall be properly distributed. Coordinate curb construction with pitch of roof. Curbs shall be built to match the roof pitch in accordance with all requirements of this project. Positive attachment of the curb to the structure is imperative. Pitch correction shall be fabricated from 12 gauge galvanized material and be continuous on all sides and ends. Field fabricated and installed tube steel stub-

- ups are not acceptable. HVAC contractor shall provide detailed information to the curb manufacturer regarding pitch correction.
- 2) Plenum Sections: The side material must be capable of handling the static pressure developed by the fans and not 'oil can'. Provide spanning bar joists as required to support plenum installation (even when the spring pockets are center span).
 - 3) Provide a continuous bottom tube steel member or side material of sufficient strength. Mechanical contractor shall coordinate and verify all dimensions, weights, roof penetrations, etc. with the Structural Engineer prior to installation.
 - 4) Curb Insulation: Provide spring curbs with a space between the floating and non-floating parts for the installation of insulation. Curb manufacturer shall provide factory installed insulation adhered to roof curb. Curbs shall be externally factory insulated with a 1.7" thick R-12 foam insulation, FM Class 1 and UL Class A Ratings, with bonded fiber reinforced facer.
- m. Protection: Curbs shall be completely shrink-wrapped during shipping.
- n. Mechanical contractor shall provide all necessary materials to completely weather proof and sound proof the curb installation.
- o. Additional features:
- 5) Sound barrier: Provide a sound barrier package, consisting of G60 galvanized back-to-back angles. Sound barrier package shall be capable of supporting two layers of 1/2" Durock concrete board with a maximum deflection over the width of the curb of L/360. Durock furnished and installed by the HVAC Contractor. Overlap all joints, caulk all seams and edges. Transmission Loss & STC shall be as shown as follows. Sound Transmission Loss at Frequency (Cycles per second) of (125)=20, (250)=27, (500)=30, (1000)=32, (2000)=30, (4000)=38, (STC)=31.
 - 6) Provide with framed Supply & Return air duct openings. Openings shall match duct sizes and have 1" galvanized steel flanges.
 - 7) Plenum sections: Where indicated on the drawings, provide in the interior of the curb, double wall acoustical floor, walls and plenum divider. All insulation shall be 2" thick fiber glass acoustical duct liner with reinforced coating system. Insulation acoustical performance shall be as follows. Liner shall not support microbial growth and shall be EPA registered and pass ASTM C 1071 & ASTM G21 bacterial tests conducted in accordance with ASTM G22. Floors up to 90" curb I.D. width shall be constructed of 22 Ga., 20 Ga. thereafter, solid G60 galvanized bottom panels and 22 Ga. galvanized perforated 22.7% open area top panel. Floor shall be attached to walls and plenum divider to provide an airtight plenum. Walls shall have 22 Ga. galvanized perforated 22.7% open area inside panels. Plenum divider shall be double wall 22 Ga. perforated galvanized 22.7% open area panel on the supply side with a 14 gauge solid panel opposite. Sound Absorption Coefficient at Frequency (Cycles per second) of (125)=.23, (250)=.64, (500)=.99, (1000)=1.05, (2000)=1.00, (4000)=.98, (NRC)=.90,
2. Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Dacron tire cord friction ring. Solid steel rings shall be used within the raised face rubber ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes 2" and larger shall have two spheres reinforced with a ring between spheres to maintain shape and complete with split ductile iron or steel flanges with hooked or similar interlocks. Sizes 16' to 24" may be single sphere. Sizes 3/4" to 1 1/2" may have threaded bolted flange assemblies, one sphere and cable retention. 14" and smaller connectors shall be rated at 250 psi up to 190°F. with a uniform drop in allowable pressure to 190 psi at 250°F. 16" and larger connectors are rated 180 psi at 190°F. and 135 psi at 250°F. Safety factors to burst and flange pullout shall be a minimum of 3/1. All joints must have permanent markings verifying a 5 minute factory

test at twice the rated pressure. Concentric reducers to the above specifications may be substituted for equal ended expansion joints.

Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods, as control rods are not desirable in seismic work. If control rods are used, they must have 1/2" thick Neoprene washer bushings large enough in area to take the thrust at 1000 psi maximum on the washer area. Expansion joints shall be installed on the equipment side of the shut off valves.

Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves. Expansion joints shall be SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and Control Rods CR as manufactured by Mason Industries, Inc.

3. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be as tabulated:

<u>Flanged</u>		<u>Male Nipples</u>	
3 x 14	10 x 26	½ x 9	1-½ x 13
4 x 15	12 x 28	¾ x 10	2 x 14
5 x 19	14 x 30	1 x 11	2-1/2 x 18
6 x 20	16 x 32	1-1/4 x 12	
8 x 22			

Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible. Hoses shall be type BSS as manufactured by Mason Industries, Inc.

4. All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2" thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi and the design shall be balanced for equal resistance in any direction. All-directional anchors shall be type ADA as manufactured by Mason Industries, Inc.
5. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of ± 1 5/8" motion, or to meet location requirements. Pipe guides shall be type VSG as manufactured by Mason Industries, Inc.
6. Split Wall Seals consist of two bolted pipe halves with minimum 3/4" thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240°F., 10# density fiberglass may be used in lieu of the sponge. Seals shall be Type SWS as manufactured by Mason Industries, Inc.
7. The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup as described in specification 5 with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at

the factory and adjusted in the field to allow for a maximum of 1/4" movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the duct work or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit. Horizontal thrust restraints shall be type WBI/WBD as manufactured by Mason Industries, Inc.

PART 3 - EXECUTION

3.1 General

- A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data. At the completion of all construction work the vibration and seismic device supplier shall inspect all installations and provided a written report of installation compliance to the engineer of record. A copy of this written certification shall also be provided in the operations manual provided to the owner.
- B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or duct work resulting in stresses or misalignment.
- C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.
- D. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
- E. Coordinate work with other trades to avoid rigid contact with the building.
- F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
- G. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractor's expense.
- H. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractors expense.
- I. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:
 - 1. Flanges of structural beams.
 - 2. Upper truss cords in bar joist construction.
 - 3. Cast in place inserts or wedge type drill-in concrete anchors.
- J. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.
- K. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

- L. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 14 braces.
- M. At all locations where specification 12 or 13 restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with specification type 15 braces.
- N. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 19 female wedge type for floor mounted equipment.
- O. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.
- P. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24" or specified movements exceed specification 23 capabilities.
- Q. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide specification 27 wall seals.
- R. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be specification type 28.
- S. Locate isolation hangers as near to the overhead support structure as possible.

3.2 Vibration Isolation and Seismic Restraint of Piping, Ductwork, and Conduit

- A. Where piping connects to rotating or vibrating mechanical equipment install specification 23 expansion joints or specification 24 stainless hoses if 23 is not suitable for the service.
- B. Seismic Restraint of Piping:
 - 1. Seismically restrain all piping listed as a, b or c below. Use specification 12 cables.
 - a. Fuel oil piping, gas piping, medical gas piping, and compressed air piping.
 - b. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" I.D. and larger.
 - c. All other piping 2 1/2" diameter and larger.
 - 2. Transverse piping restraints shall be at 40' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
 - 3. Longitudinal restraints shall be at 80' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
 - 4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
 - 5. For fuel oil and all gas piping transverse restraints must be at 20' maximum and longitudinal restraints at 40' maximum spacing.
 - 6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.
 - 7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
 - 8. Branch lines may not be used to restrain main lines.
- C. Pipe Isolation

1. All chilled water, condenser water, hot water, steam, refrigerant, drain and engine exhaust piping that is connected to vibration-isolated equipment shall be isolated from the building structure within the following limits:
2. Within mechanical rooms;
3. Within 50' total pipe length of connected vibration-isolated equipment (chillers, pumps, air handling units, pressure reducing stations, etc.);
4. At every support point for piping that is greater than 4 inches in diameter.
5. Piping shall be isolated from the building structure by means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals.
6. Isolators for the first three support points adjacent to connected equipment shall achieve one half the specified static deflection of the isolators supporting the connected equipment. When the required static deflection of these isolators is greater than 1/2", Type FSN or HSN isolators shall be used. When the required static deflection is less than or equal to 1/2", Type FN or HN isolators shall be used. All other pipe support isolators within the specified limits shall be either Type FN or HN achieving at least 1/4" static deflection.
7. Where lateral support of pipes is required within the specified limits, this shall be accomplished by use of resilient lateral supports.
8. Pipes within the specified limits that penetrate the building construction shall be isolated from the building structure by use of resilient penetration sleeve/seals.
9. Provide flexible pipe connections as called for under Major Equipment above and wherever shown on the drawings.

D. Seismic restraint of ductwork:

1. Seismically restrain all duct work with specification 12 or 13 restraints as listed below:
 - a. Restrain rectangular ducts with cross sectional area of 6 sq. ft. or larger.
 - b. Restrain round ducts with diameters of 28" or larger.
 - c. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
2. Transverse restraints shall occur at 30' intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
3. Longitudinal restraints shall occur at 60' intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
4. The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
5. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
6. Walls, including gypsum board non bearing partitions, which have ducts running through them may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.

E. Duct Isolation:

1. All sheet metal ducts and air plenums that are within mechanical rooms or within a distance of 50' total duct length of connected vibration-isolated equipment (whichever is longer) shall
2. be isolated from the building structure by Type FN, PCF or HN isolators. All isolators shall achieve 0.1" minimum static deflection.
3. Ducts within the specified limits that penetrate the building construction shall be isolated from the building structure by use of resilient penetration sleeve/seals.
4. Flexible duct connections shall be provided as called for above under Major Equipment and wherever shown on the drawings.

- F. Seismic Restraint of Electrical Services:
1. All electrical conduit 2-1/2" in diameter and larger shall be restrained with specification type 12 seismic cable restraints or specification type 13 for seismic solid brace restraints.
 2. All electrical bus ducts, cable trays and ladder trays shall be restrained with specification type 12, seismic cable restraints or specification 13 seismic solid brace restraints.
 3. Transverse restraints shall occur at 30' intervals or both ends if the electrical run is less than the specified interval. Transverse restraints shall be installed at each electrical services turn and at each end of the electric run.
 4. Longitudinal restraints shall occur at 60' intervals with at least one restraint per electric run. Transverse restraints for one electric section may also act as a longitudinal restraint for a duct for an electric section connected perpendicular to it if the restraints are installed within 4' of the intersection of the electric run and if the restraints are sized for the larger electric run.
 5. All rigid floor mounted equipment must have a resilient media between the equipment mounting hole and the anchor bolt. Neoprene bushings shall be specification type 4 and anchor bolts shall be specification type 18 or 19.
 6. Wall mounted panels shall be mounted with specification type 3 bushings. Floor mounted panels shall be mounted on specification type 4 bushings. Anchor bolts shall be specification type 18 or 19.
- G. All fire protection piping shall be braced in accordance with NFPA 13 and 14.
- H. All mechanical equipment shall be vibration isolated and seismically restrained.
1. All fire protection equipment is considered life safety equipment and shall be seismically restrained.

3.3 Seismic Restraint Exclusions

- A. Piping:
1. All piping less than 2 1/2" except for gas and fire protection piping.
 2. All piping in boiler and mechanical equipment rooms less than 1 1/4" I.D.
 3. All clevis or trapeze supported piping suspended from hanger rods where the point of attachment is less than the 12" in length from the structure to the structural connection of the clevis or trapeze.
 4. All PVC and fiberglass suspended waste or vent pipe 6" in diameter and smaller.
- B. Ductwork:
1. Rectangular, square or oval ducts less than 6 sq.ft. in cross sectional area.
 2. Round duct less than 28" in diameter.
 3. Duct supported by hanger rods where the point of attachment is less than 12" in length from the structure to the structural connection of the duct work.
- C. Electrical:
1. All conduit less than 2 1/2" diameter suspended by individual hanger rods.
 2. All clevis or trapeze supported conduits suspended by hanger rods where the point of attachment is less than 12" in length from the structure to the structural connection of the clevis or trapeze.

3.4 INSTALLATION OF VIBRATION ISOLATION EQUIPMENT

- A. General
1. Locations of all vibration isolation devices shall be selected for ease of inspection and adjustment as well as for proper operation.
 2. Installation of vibration isolation equipment shall be in accordance with the manufacturer's instructions.

B. Isolators

1. All vibration isolators shall be aligned squarely above or below mounting points of the supported equipment.
2. Isolators for equipment with bases shall be located on the sides of the bases which are parallel to the equipment shaft unless this is not possible because of physical constraints.
3. Locate isolators to provide stable support for equipment, without excess rocking.
4. Consideration shall be given to the location of the center of gravity of the system and the location and spacing of the isolators. If necessary, a base with suitable footprint shall be provided to maintain stability of supported equipment, whether or not such a base is specifically called for herein.
5. If a housekeeping pad is provided, the isolators shall bear on the housekeeping pad and the isolator base plates shall rest entirely on the pad.
6. Hanger rods for vibration-isolated support shall be connected to major structural members, not the floor slab between major structural members. Provide suitable intermediate support members as necessary.
7. Vibration isolation hanger elements shall be positioned as high as possible in the hanger rod assembly, but not in contact with the building structure, and so that the hanger housing may rotate a full 360° about the rod axis without contacting any object.
8. Parallel running pipes may be hung together on a trapeze that is isolated from the building. Isolator deflections must be the greatest required by the provisions for pipe isolation for any single pipe on the trapeze. Do not mix isolated and unisolated pipes on the same trapeze.
9. Pipes, ducts and equipment shall not be supported from other pipes, ducts and equipment.
10. Resiliently isolated pipes, ducts and equipment shall not come in rigid contact with the building construction or rigidly supported equipment.
11. The installed and operating heights of equipment supported by Type FSNTL isolators or with Type RC-2 isolation bases shall be identical. Limit stops shall be out of contact during normal operation. Adjust isolators to provide 1/4" clearance between the limit stop brackets and the isolator top plate, and between the travel limit nuts and travel limit brackets.
12. Adjust all leveling bolts and hanger rod bolts so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.

C. Bases

1. No equipment unit shall bear directly on vibration isolators unless its own frame is suitably rigid to span between isolators and such direct support is approved by the equipment manufacturer. This provision shall apply whether or not a base frame is called for on the schedule. In the case that a base frame is required for the unit because of the equipment manufacturer's requirements and is not specifically called for on the equipment schedule, a base frame recommended by the equipment manufacturer shall be provided at no additional expense.
2. Unless otherwise indicated, there is to be a minimum operating clearance of 1" between steel rails, steel frame bases or inertia bases and the floor beneath the equipment. The isolator mounting brackets shall be positioned and the isolators adjusted so that the required clearance is maintained. The clearance space shall be checked by the Contractor to ensure that no construction debris has been left to short circuit or restrict the proper operation of the vibration isolation system.
3. Isolation bases shall be installed in strict accordance with the manufacturer's instructions.

D. Flexible Duct Connections:

1. Prior to installation of the flexible connection, sheet metal ducts and plenum openings shall be squarely aligned with the fan discharge, fan intake, or adjacent duct section, and the gap between connected parts shall be uniform. Flexible duct connections shall not be installed

until this provision is met. There shall be no metal-to-metal contact between connected sections, and the fabric shall not be stretched taut.

- E. Flexible Pipe Connections:
 - 1. Install flexible pipe connections in strict accordance with the manufacturer's instructions.

- F. Thrust Restraints:
 - 1. Thrust restraints shall be attached on each side of the fan parallel to the thrust force. This may require custom brackets or standoffs. The body of the thrust restraint shall not come in contact with the connected elements. Thrust restraints shall be adjusted to constrain equipment movement to the specified limit.

- G. Grommets:
 - 1. Where grommets are required at hold down bolts of isolators, bolt holes shall be properly sized to allow for grommets. The hold down bolt assembly shall include washers to distribute load evenly over the grommets. Bolts and washers shall be galvanized.

- H. Resilient Penetration Sleeve/Seals:
 - 1. Maintain an airtight seal around the penetrating element and prevent rigid contact between the penetrating element and the building structure. Fit the sleeve tightly to the building construction and seal airtight on both sides of the construction penetrated with acoustical sealant.

END OF SECTION

SECTION 26 00 00: ELECTRICAL
(Filed Sub-Bid Required)

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END OF INDEX

SECTION 260000: ELECTRICAL
(Filed Sub-Bid Required)

PART 1 - GENERAL

1.1 FILING SUB-BIDS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Time, Manner and Requirements for Submitting Sub-Bids:
1. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the _____ at a time and place as stipulated in the "NOTICE TO CONTRACTORS".

The following should appear on the upper left hand corner of the envelope:

NAME OF SUB-BIDDER: (Insert name of sub-bidder)

PROJECT: (Insert project number from top of page))

SUB-BID FOR SECTION: 26 00 00 – ELECTRICAL

2. Each sub-bid submitted for work under this Section shall be on forms furnished by the _____ as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms may be obtained at the office of the _____, or may be obtained by written or telephone request; telephone _____.
 3. Sub-bids filed with the _____ shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S CHECK or CASHIER'S CHECK issued by a responsible bank or trust company payable to the _____ in the amount of five percent of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.
- C. Sub Sub-Bid Requirements:
None
- D. Reference Drawings: The Work of this Filed Sub-Bid is shown on the following Contract Drawings:
- E0.1 SYMBOL LIST, LIGHTING FIXTURE SCHEDULE AND NOTES
 - E1.1 NEW LIGHTING PLAN ELECTRICAL
 - E2.1 NEW POWER PLAN ELECTRICAL
 - PARTIAL FIRE ALARM RISER, MECHANICAL SCHEDULE AND ONE LINE
 - E3.1 RISER DIAGRAM
 - ED1.1 DEMOLITION PLAN ELECTRICAL

1.2 RELATED DOCUMENTS

- A. This section is only a portion of the Contract Documents. All of the Contract Documents, including Conditions of the Contract and Division 01 General Requirements, apply to this section.
- B. Filed Sub-bid Coordination: Filed sub-bidders shall review all Contract Documents including Conditions of the Contract and Division 01 General Requirements. Without limitation or restriction, Division 01

General Requirements contain requirements and assignments of responsibility for alternates, administration, engineering by contractors, submittals, safety, quality control, cutting, hoisting, scaffolding, temporary water, temporary electric power, demolition, warranties, contract closeout, and other requirements.

- C. The following definitions apply to the Drawings and Specifications:
1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
 2. Install: The term "install" is used to describe operations at project site including actual "unloading, unpacking, rigging in place, assembly, erection, piecing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
 3. Provide: The term "provide" means to "furnish and install, complete and ready for the intended use".
 4. Installer: An "installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or Sub-Subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 5. Conduit: Raceways of the metallic type which are not flexible. Specific types as specified.
 6. Connect: To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.
 7. Subject to Mechanical Damage: Equipment and raceways installed exposed and less than eight feet above finished floor in mechanical rooms or other areas where heavy equipment may be in use or moved.
 8. Furnish and install, removing when no longer needed, all temporary lifts, hoists, staging, scaffolding, rigging, labor and materials, and temporary support to perform all operations in connection with the installation of this work." Coordinate with Division 01.
- D. When open-flame or spark producing tools such as blower torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch where work is being performed and until it is completed.

1.3 SUMMARY OF WORK

- A. Work described herein shall be interpreted as work to be done by the Electrical Subcontractor. Work to be performed by other trades will be referenced to a particular contractor or subcontractor.
- B. Provide all labor, materials, tools, and equipment, to complete the installation of the electrical system. Install, equip, adjust, and put into operation the respective portions of the installation specified, and so interconnect various items or sections of work in order to form a complete and operating whole. Systems may be referenced in singular or plural terms, also refer to drawings to confirm quantities. The work shall consist of, but shall not necessarily be limited to, the following:
1. Secondary distribution equipment, including modifications to existing switchboard and distribution panel, motor controls, variable frequency drives, panelboards, including all feeders and sub-feeders.
 2. Fire alarm system extension.
 3. Emergency lighting system, including new battery units for emergency lighting and exit signs.
 4. Interior lighting systems, including lamps, fixtures, and controls.
 5. All raceway systems, including boxes, couplings, and fittings.
 6. All branch circuit wiring systems, including wiring devices, plates, etc.
 7. Connections for all building equipment, including mechanical, plumbing, fire protection, and owner's equipment.

8. Systems Identification.
9. All through-penetration firestopping required by this Section shall be provided by the Electrical Sub-Contractor in accordance with Section 07 84 10 – Penetration Firestopping. Refer to architectural drawings for surfaces requiring thru-penetration firestopping.
10. Provide Seismic Restraints for all Electrical Systems conforming to the requirements of Section 23 05 48 – Vibration Control and Seismic Restraint which section is herein incorporated by reference.
11. Coordination Drawings.
12. Provisions for Tel/Data, Video, and CATV, including 120 volt sources, outlet boxes and raceway system, grounding, firestopping, as indicated on drawings.
13. Modifications to existing paging and intercom system in the way of construction.
14. Alternates affecting this section.
15. All testing of equipment installed.
16. Sealing of all penetrations through walls, slabs, partitions, which are not fire rated.
17. Furnish and install access doors and frames where required for new work.
18. Any other item of work hereinafter specified or indicated on electrical drawings.

1.4 ITEMS TO BE FURNISHED ONLY

- A. Furnish the following items for installation under designated sections.
 1. Duct smoke detectors with sampling tube, Section 23 10 00 - HVAC.

1.5 ITEMS TO BE INSTALLED ONLY

- A. Install the following items furnished under designated sections.
 1. Specialty Backboxes – School's IT Department.

1.6 RELATED WORK UNDER OTHER SECTIONS

- A. The following work is included in other sections. Coordinate the work of this section as required.
 1. Insulation - SECTION 07 21 00 – Thermal Insulation.
 2. Finish Painting: SECTION 09 90 00 – Painting And Coating.
 3. Temporary light and power including payment for energy used shall be by General Contractor.
 4. Automatic Temperature Control: SECTION 23 00 00 - HVAC.
 5. Door Hardware: SECTION 08 71 00 - Door Hardware.
 6. Communications system wiring and equipment: School's IT Department.

1.7 CONTRACT COST BREAKDOWN

- A. Submit a breakdown of contract price to aid Architect in determining value of work installed as job progresses.

1.8 INSPECTION OF SITE

- A. Electrical bidders will be permitted to inspect site. Failure to inspect existing conditions or to fully understand work which is required shall not excuse Electrical Subcontractor from his obligations to supply and install work in accordance with specifications and the drawings and under all site conditions as they exist.

1.9 CONTRACTOR'S REPRESENTATIVE

- A. Retain a competent representative on the project.

1.10 COOPERATION

- A. Work shall be carried on under usual construction conditions, in conjunction with other contractors work. Cooperate with other contractors, coordinate work and proceed in a manner as not to delay progress.
- B. Before proceeding, examine all construction drawings and consult other contractors to coordinate installation and avoid interference.
- C. In case of dispute, the Architect will render a decision in accordance with General and Supplementary General Conditions.

1.11 CODES, ORDINANCES, AND PERMITS

- A. Codes and Ordinances:
 - 1. All material and work provided shall be in accordance with the following codes and standards as most recently amended.
 - Commonwealth of Massachusetts Building Code
 - Massachusetts Electric Code, 2011 Edition
 - State Department of Public Safety
 - NFPA 101 "Life Safety Code"
 - NFPA Standards
 - Standards of the Underwriters Laboratories (UL)
 - Occupational Safety and Health Act (OSHA)
 - Americans with Disabilities Act (ADA)
 - Energy Conservation Code
 - Town of Arlington
 - 2. Where contract documents indicate more stringent requirements than codes, the contract documents shall take precedence.
- B. Permits: Be responsible for filing documents, and securing of inspection and approvals. Pay all permit fees.
- C. Utility Company backcharges for permanent service will be paid directly by the Owner. Costs related to temporary service will be paid by General Contractor as noted in SECTION 01 50 00. Refer to INSTRUCTIONS TO BIDDERS AND SUPPLEMENTARY GENERAL CONDITIONS.

1.12 ELECTRICAL ROOMS OR SPACES

- A. Be responsible for ensuring that the dedicated space and clearances required in the NEC, Sections 110-26 and 110-16 are maintained for all electrical equipment.
- B. Call other contractors' attention to the requirements contained in the above mentioned code sections, prior to the installation of equipment by other contractors, in order to ensure no violations.

1.13 SUBMITTALS

- A. Refer to Supplementary General Conditions for information relative to submission of shop drawings. Six copies are required. No equipment for which review is required shall be installed prior to review, except at Contractor's own risk. Shop Drawings will be required for all electrical equipment.

- B. Notwithstanding any restrictions upon contractor proposed substitutions, should apparatus or materials be permitted by Architect to be substituted for those specified for good cause, and such substitution necessitates changes in or additional connections, piping, supports, or construction, same shall be provided. Assume cost and entire responsibility thereof.
- C. Submit the following samples:
 - 1. Other items as may be requested.

1.14 GUARANTEE

- A. Keep work in repair without expense to Owner as far as concerns defects in workmanship or materials for a period of not less than one year from date of substantial completion. Refer to UPS, External Bypass Switch and PDU sections where a three year guarantee is required.

1.15 ELECTRICAL CHARACTERISTICS

- A. In general, and unless specifically indicated otherwise, all building service, heating, ventilating, air conditioning, and plumbing equipment shall be of the following characteristics.
 - 1. Motors up to and including 1/3 HP shall be suitable for 120 volts, one phase operation.
 - 2. Motors larger than 1/3 HP shall be suitable for 208 volts, three phase operation.
 - 3. Electric heating equipment 1.5 KW and less shall be suitable for 120 volt single phase operation. Over 1.5KW shall be 208 volt three phase.
- B. Power Factor: All equipment provided rated greater than 1,000 watts and lighting equipment greater than 15 watts with an inductive reactance load component shall have a power factor of not less than 90 percent under rated load conditions.

1.16 TEMPORARY ELECTRICAL SUPPORT FACILITIES

- A. Refer to and comply with Division 01 and the following:
- B. Provide own field office and/or storage facilities which shall be located as directed or permitted by General Contractor and in accordance with local regulations. Provide all tools, equipment, ladders, and temporary construction required for execution of the work.
- C. All scaffolding, ladders, and other temporary construction shall be rigidly built in accordance with all local and state requirements, and shall be removed upon work completion.

1.17 RECORD DRAWINGS

- A. Refer and comply with Division 01 and the following;
- B. Provide two sets of black or blue line on white drawings to maintain and submit record drawings, one set shall be maintained at site and which shall be accurate, clear, and complete showing actual location of all equipment as installed. Record drawings shall be updated at least monthly. Record drawings shall show outlet from which homeruns are taken, and location of all junction boxes and access panels. These drawings shall be available to Architect/Engineer field representative.
- C. Any addenda sketches and supplementary drawings issued during course of construction shall be attached to drawings.
- D. At completion, submit an accurate checked set of drawings.

- E. After approval of these drawings, photo reproductions of original tracings shall be revised to incorporate changes, including addenda sketches and supplementary drawings. These "as-built" photo reproductions shall be certified as correct and delivered to the Architect along with two sets of black line prints. Provide an Auto-Cad CD of the as-built drawings.

1.18 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS

- A. Refer to and comply with Division 01 and the following:
- B. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full three days of Electrical Subcontractor's time shall be included in contract. Cost of providing a manufacturer's representative at site for instructional purposes shall also be included.
- C. Maintenance Manuals:
 - 1. Provide four copies of complete manuals containing the following:
 - a. Complete shop drawings of equipment.
 - b. Operation description of systems.
 - c. Names, addresses, and telephone numbers of suppliers of systems.
 - d. Vendors' P.O. numbers for equipment installed.
 - e. Preventive maintenance instructions for systems.
 - f. Spare parts list of system components.
 - 2. All information shall be in binders.

1.19 INSPECTIONS AND TESTS

- A. Inspection: If inspection of materials installed shows defects, such defective work, materials, and/or equipment shall be replaced and inspection and tests repeated.
- B. Tests: Make reasonable tests and prove integrity of work and leave electrical installation in correct adjustment and ready to operate. All panels and switchboards shall have phases balanced as near as practical. A consistent phase orientation shall be adhered to at all terminations.

1.20 RETURN AIR PLENUM

- A. All wiring above hung ceilings shall either be run in conduit or be "UL listed" plenum cable.

1.21 OWNER FURNISHED EQUIPMENT

- A. The owner will furnish certain materials, which will be installed and wired under this Section of the specifications.
- B. This contractor shall be responsible for handling, storing, and inventory of owner furnished equipment. The contractor shall be responsible in all aspects of material handling and shall provide for "tailgate" delivery.

1.22 PHASING, DEMOLITION AND MAINTAINING EXISTING SERVICES

- A. During the execution of the work, required relocation, rerouting of existing equipment and systems in the existing building areas where new work is to be installed or new connections are scheduled to be made, shall be performed by the Electrical Subcontractor, as required by job conditions and as

determined by the Architect in the field, to facilitate the installation of the new system, while demolition, relocation work or new tie-ins will be performed. Outages required for construction purposes shall be scheduled for the shortest practical periods of time, in coordination with the Owner's designated representative, for specified, mutually agreeable periods of time, after each of which the interruption shall cease and the service shall be restored. This procedure shall be repeated to suit the Owner's working schedule, as many times as required until all work is complete. Any outages of service shall be approved by the Owner, prior to commencing the work. No outages or shutdowns of service shall occur without the written authorization of the Owner prior to commencing the work. Give notice of any scheduled shutdowns, a minimum of two weeks in advance.

Owner shall make their best effort to meet this request without adversely affecting the electric service to the existing building.

- B. Prior to any deactivation and relocation or demolition work, consult the drawings and arrange a conference with the Architect and the Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect all equipment designated to be relocated and reused or to remain in operation and be integrated with the new systems.
- C. Where existing outlets are to be reused and are cut off by the remodeling, they shall be reconnected to existing circuits as required by field conditions. Where existing outlets are to be abandoned, they shall be removed and blank plates installed. Each bidder shall, before submitting his bid, visit the site and make a thorough examination of the conditions in the existing buildings in order to determine the extent of the work to be done.
- D. All deactivation, relocation and temporary tie-ins of electrical systems and equipment shall be provided by the Electrical Subcontractor. All demolition and removal of electrical systems and equipment designated to be demolished shall be by the Electrical Subcontractor. Stack all demolished electrical materials except hazardous materials (PCB lighting ballasts, fluorescent lamps, etc.) nearby for removal by the General Contractor. All hazardous electrical materials shall be stacked as directed by General Contractor and shall be legally disposed by the General Contractor. The General Contractor will be removing the lamps and ballasts from the fixtures.
- E. The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.
- F. Phasing
 - 1. The Electrical Subcontractor shall construct the subject in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.
 - 2. For additional information related to phasing, review the General Conditions and Supplementary Conditions and the Architectural drawings.

1.23 ALTERNATES

- A. Refer to Section 01 23 00 for Alternates affecting this section.
- B. Include in your bid a separate price for amounts to be added or deducted from base bid amount for the following areas of electrical work:
 - 1. Alternate No. 1: Delete electrical work associated with new rooftop unit RTU-1.
 - 2. Alternate No. 2: Eliminate work associated with creating Rooms 608C and 609C as indicated on drawings.

1.2 UNIT PRICES

- A. Additional work shall be performed by contractor as directed at unit prices listed. If any work is eliminated, the eliminated work shall be credited at unit price list.
- B. Unit prices shall include materials, labor, overhead, and profit necessary for complete installation of item.
- C. Unit price items shall include devices or fixtures wired complete in accordance with specifications.

	<u>ITEM</u>	<u>UNIT PRICE</u>
1.	20A/120 Volt Duplex Receptacle with 25 feet of wiring	
2.	Duplex Data Outlet with 100 feet of CAT 6 Cable	

PART 2 – PRODUCTS

2.1 GENERAL

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For purpose of establishing a standard of quality and not for purpose of limiting competition, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.
- C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a manufacturers' standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers' products will be unacceptable.
- D. Where Specifications list manufacturers' names and/or "as approved" or "Equal approved by Architect", other manufacturers' equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Architect.
- E. All material shall be new and shall be UL listed.

2.2 RACEWAYS AND FITTINGS

- A. Raceways - General:
 - 1. No raceway shall be used smaller than 3/4 in. diameter and shall have no more than four (4) 90 deg. bends in any one run, and where necessary, pull boxes shall be provided. Only rigid metal conduit or intermediate metal conduit is allowed for slab work. Cable systems, if allowed to be used by other sections of this specification, shall not be used exposed or in slabs, whether listed by "UL" for such use or not.

2. Rigid metal conduit conforming to, and installed in accordance with, Article 344 shall be heavy wall zinc coated steel conforming to American Standard Specification C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, where raceway may be subject to mechanical damage.
 3. Intermediate metal conduit conforming to, and installed in accordance with Article 342, may be used for all applications where rigid metal conduit is allowed by these specifications.
 4. Electrical Metallic Tubing (EMT), conforming to, and installed in accordance with, Article 358 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings, where exposed but not subject to mechanical damage, and may be used for fire alarm work.
 5. Flexible metal conduit shall be used for final connections to recessed lighting fixtures from above ceiling junction boxes and for final flexible connections to motors and other rotating or vibrating equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include an insulated grounding conductor. Rigid non-metallic conduit may be used for underground electric and low tension services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40, 90°C. PVC schedule 40 may also be used below slab. PVC Schedule 40 shall not be used in slabs, or where it penetrates slab or foundation wall. PVC Schedule 40 may be used for outside feeders and branch circuits. Below slab conduits do not require concrete encasement.
 6. Acceptable manufacturers:
 - a. Pittsburgh Standard Conduit Company
 - b. Republic Steel and Tube
 - c. Youngstown Sheet and Tube Company
 - d. Carlon
 - e. Or equal
 7. Fittings:
 - a. Provide insulated bushings on all raceways 1 inch diameter or larger.
 - b. Manufacturer's standard fittings shall be used for raceway supports.
 - c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
 - d. Couplings for rigid metal and intermediate metal conduit shall be threaded type.
 - e. Threadless fittings for EMT shall be watertight compression type or set-screw type (dry-locations). All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.
 - f. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.
 - g. Wall entrance seals shall be equal to O.Z. Gedney type "WSK".
 - h. Couplings, elbows and other fittings used with rigid nonmetallic conduit shall be of the solvent cemented type to secure a waterproof installation.
 - i. Acceptable manufacturers:
 - 1) O.Z.
 - 2) Crouse Hinds
 - 3) Appleton
 - 4) EFCOR
 - 5) Steel City
 - 6) Or equal
- B. Outlets, Pull and Junction Boxes:
1. Outlets:
 - a. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations or surface mounted shall be of the cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc

coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction. Thru the wall boxes are not permitted.

- b. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of Code. Boxes shall not be less than 1-1/2 in. deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4 in. octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4 in. square or of comparable volume.
 - c. Far side box supports shall be Caddy J-1A.
 - d. Acceptable manufacturers:
 - 1) Appleton
 - 2) Crouse Hinds
 - 3) Steel City
 - 4) RACO
 - 5) Or equal
2. Pull and Junction Boxes: Where indicated on plans, and where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code.

Boxes in moist or wet areas shall be galvanized type. Boxes larger than 4-11/16 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

- a. Acceptable Manufacturers:
 - 1) Brasch
 - 2) Hoffman
 - 3) Keystone
 - 4) Lee Products Co.
 - 5) McKinstry Inc.
 - 6) Eldon Inc.
 - 7) Or equal

2.3 CONDUCTORS

- A. All conductors shall be a minimum size of #12 AWG except for control wiring and fire alarm wiring where #14 AWG may be used. For all exit sign circuits, normal/emergency and/or emergency only circuits, exterior lighting circuits, and also where distance from panelboard to first outlet exceeds 80 ft. at 120 volts, #10 AWG shall be minimum size wire allowed. All feeder and branch circuit conductor shall be color coded as follows:
 1. 208Y/120V Phase A Black
 2. 208Y/120V Phase B Red
 3. 208Y/120V Phase C Blue
 4. Grounded Conductor
 120/208 White
 5. Equipment Ground
 120/208 Green
- B. All conductors not installed in accordance with color scheme shall be replaced. All conductors larger than #6 AWG must be identified with colored tape.

- C. Connections throughout the entire job shall be made with solderless type devices.
 - 1. For #10 AWG and smaller: spring type.
 - 2. For #8 AWG and larger: circumferential compression type.
 - 3. Acceptable manufacturers:
 - 3M "Scotchlock"
 - IDEAL "Wingnut"
 - BURNDY
 - MAC
 - Or equal
 - 4. Any splices made up in ground mounted pull boxes shall be resin cast waterproof type or waterproof pressure type, as manufactured by King Technology, St. Louis, MO.
- D. Conductors shall be copper, soft drawn, and annealed of 98 percent conductivity. Conductors larger than #10 AWG shall be stranded; #10 AWG and smaller shall be solid. Conductors shall be insulated for 600 volts and be of following types:
 - 1. All conductors shall have heat/moisture resistant thermoplastic insulation type THHN/THWN (75 percent C) except as follows:
 - a. In sizes #1 AWG and larger: Crosslinked polyethylene insulation type XHHW (75 percent C – 90 percent C) may be used.
 - b. Fire alarm system conductors shall be #14 AWG, type THHN, solid. Color coding of fire alarm conductors shall be in accordance with fire codes.
 - c. Fixture whips #16AWG type "SF".
- E. Stranded conductors for all wiring systems except fire alarm will be allowed if installed and terminated as specified under Execution Section.
- F. Type MC cable may be used for concealed branch circuits where allowed by code if installed and terminated as specified under Execution Section. Armor to be galvanized steel and shall be UL listed for 2-hour firewall penetration.
- G. Type MC Fire Alarm Control Cable with red armor may be used for fire alarm where concealed and allowed by code.
- H. Acceptable manufacturers:
 - 1. AFC Cable Systems
 - 2. American Wire & Cable
 - 3. Cerro
 - 4. Cornish
 - 5. Cresent
 - 6. General Cable
 - 7. Okonite
 - 8. Or equal

2.4 ACCESS PANELS

- A. Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.
- B. Access panels shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that junction can be easily reached and size shall be sufficient for

purpose (minimum size 12 in. x 12 in.). When access panels are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the architect.

C. Access panels shall be prime painted and equipped with screwdriver operated cam locks.

1. Acceptable manufacturers:
2. Inland Steel Products Company - Milcor
3. Miami Carey
4. Walsh-Hannon-Gladwin, Inc. - Way Locator
5. Or equal.

Specific types:

- | | | |
|----|-------------------------|------------------|
| a. | Acoustical Tile Ceiling | "Milcor Type AT" |
| b. | Plastered Surfaces | "Milcor Type K" |
| c. | Masonry Construction | "Milcor Type M" |
| d. | Drywall Construction | "Milcor Type DW" |

D. Furnish access panel shop drawings.

2.5 SLEEVES, INSERTS AND OPENINGS

A. Sleeves: Provide sleeves of proper sizes for all openings required in concrete floors and walls. Sleeves passing through floors shall be set with top of sleeve 1 in. above finished floor. Core drilling will also be acceptable if in accordance with any structural standards. Any unsleeved openings shall be waterproofed.

B. Inserts: Provide inserts or other anchoring devices in concrete and masonry construction as required to support raceways and equipment.

C. Openings: Where an opening is required in concrete slabs to allow passage of a multitude of raceways, give adequate notice to General Contractor so he may box out opening in form work.

D. Sleeves or openings through slabs for passage of future cables shall be located within 6 inches of walls and shall be in a single row and shall be proofed whether used or not.

E. Any openings through fire rated surfaces shall be closed off with fireproofing materials providing the same rating as the surface penetrated.

Acceptable Manufacturers:

1. Specified Technologies Inc.
2. Thomas & Betts
3. International Protective Coatings Corp.
4. 3M Fire Protection Products
5. Dow Corning
6. Or equal

2.6 ELECTRICAL POWER EQUIPMENT

A. Motor Controls - Manual and magnetic:

1. Individually-mounted magnetic starters shall be NEMA rated across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated.
2. Starters shall be of maintained contact type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1 FVNR, unless noted otherwise.
 - a. Starters shall have OL reset button, green push-to-test type pilot light to indicate "ON", and "HAND-OFF-AUTO" switch in cover.

- b. Provide Class 20 fixed heater overloads with auto/manual reset.
 - c. Provide four sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.
 - d. Motor starters shall have NEMA I enclosures. Those in wet locations shall be NEMA 3R.
 - e. Acceptable Manufacturers:
 - General Electric
 - Westinghouse
 - Square D/Groupe Schneider
 - Siemens
 - Allen Bradley
 - Or equal
3. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.
- B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.
1. Provide motor terminal boxes for each motor not furnished with same.
- C. Disconnect Switches:
1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.
 2. Disconnect switches shall be of fused or unfused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches for use with current limiting fuses shall be rejection type and those used in conjunction with motors shall be horsepower rated. Provide oversize termination lugs if required by conductor size.
 3. Enclosures shall be of proper NEMA type for intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with ANSI #24 dark gray baked enamel finish.
 4. Acceptable Manufacturers:
 - Westinghouse
 - Square D/Groupe Schneider
 - Siemens
 - General Electric
 - Or Equal
- D. Fuses:
1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses, unless noted otherwise on electrical drawings. Each fuse initially installed shall be provided with Bussmann SAMI-indicating fuse covers.
 2. Turn over to authorized representative of Owner upon completion a spare set of fuses of each different type and ampere rating installed. These spares shall be bound with twine and tagged.
 3. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
 4. All fuses in distribution panelboards and switchboards shall be class "L" above 600 amperes and class "RK1" for 600 amperes and below.
 5. Main, Feeder, and Branch Circuits:

Circuits 601 amperes and above shall be protected by (Bussmann type KRP-C LOW-PEAK) current limiting time delay fuses.

Circuits 0-600 amperes shall be protected by (Bussmann "LOW-PEAK" dual element), KPS-RK (600 volts), UL class RK-1.

6. Acceptable Manufacturers:
Bussmann, Division of McGraw
Gould/Shawmut
GEC-ALSTHOM
Or equal

2.7 ELECTRICAL SYSTEM CONTROLS AND INSTRUMENTS

- A. Provide a complete power system consisting of branch circuits, motor disconnect switches, pushbutton stations, motor starters, and other devices to connect up and leave in operating condition each piece of electrically operated equipment provided either under this section or other Divisions.
- B. The Electrical Subcontractor is to provide a 120 volt source with a disconnect switch at one location next to the main automatic temperature control panel.
- C. All control wiring not indicated in the electrical specifications or not shown on electrical drawings will be provided by Temperature Control Subcontractor.

2.8 GROUNDING SYSTEM

- A. All equipment and systems shall be grounded. Refer especially to NEC Section 250 Requiring Connections to Building Steel, Foundation, Water Service, and Interior Piping. Provide transformer pad grounding to be in accordance with local utility company standards.
- B. The grounded conductor shall be supplemented by an equipment grounding system.
- C. The equipment grounding system shall be installed so all conductive items in close proximity to electrical circuits operate continuously at ground potential and provide a low impedance path for ground fault currents.
- D. Grounding conductors shall be so installed as to permit shortest and most direct path to ground.
- E. Maximum measured resistance to ground of 5.0 ohms shall not be exceeded. Ground separately derived systems (dry type transformers) in accordance with Article 250 by grounding neutral to transformer ground lug and providing insulated grounding electrode conductor to nearest effectively grounded building steel or, if unavailable, to nearest available effectively grounded metal water pipe.
- F. Equipment grounding conductors and straps shall be sized in compliance with Code Table 250-122.
- G. Grounding conductors shall be insulated with green color. Grounding conductors for use on isolated ground receptacles shall be green with trace color to differentiate between normal ground conductors.
- H. Branch circuits shall consist of phase and grounded conductor installed in common metallic raceway. The raceway system may not serve as the grounding conductor. All circuits shall have a separate insulated grounding conductor installed. Any flexible cable system or non-metallic raceway system shall have an insulated grounding conductor. Any cable system for use on isolated ground circuits shall have both an isolated ground conductor as well as an equipment ground conductor, both of which shall be insulated.

- I. Each electrical expansion fitting shall be furnished with a bonding jumper. Provide grounding bushings and ground connections for all raceways terminating below equipment where there is no metal-to-metal continuity.
- J. Continuity between all metallic and non-metallic raceway systems and equipment shall be maintained.
- K. Outdoor lighting fixtures shall be grounded and bonded in common with building system via a separate grounding conductor.

2.9 PANELBOARDS

- A. Panelboards shall be dead-front, door in door safety type equipped with single or multi-pole circuit breakers suitable for 120/208 volt, 3 phase, 4 wire operation.
- B. Buses shall be copper. Panelboards shall have a circuit directory card mounted in a frame with plastic cover on inside of door. Panelboards to have a copper ground bus with terminals for each circuit. Panelboards serving isolated ground receptacles shall have a separate ground bus for terminations of the isolated grounds. The isolated ground bus shall be mounted to the panel tub via non-conducting means with a separate grounding conductor run to the normal panel ground bus. Provide oversize lugs for any termination requiring same due to 120/208 volt panelboards.
- C. Cabinets shall be minimum of 20 inches wide and be made of code gauge steel. Surface type shall be ordered without knockouts.
- D. Trims shall be made of code gauge steel, surface or flush as indicated. Panelboards shall be keyed alike. Trims shall be provided with full length piano hinge on one side, and secured to tub with sufficient quantity of latches opposite the hinge side to allow trim to fit flush with tub and when released, allow full access to wiring gutters. Inner door shall allow access to circuit breakers only.
- E. Panelboards shall be of the following types with minimum circuit breaker frame sizes listed below. Refer to schedules for larger circuit breaker frame sizes due to fault current availability.
 - 1. 120/208 volt, three phase, four wire. Symmetrical interrupting capacity 10,000 AIC.

Style

Westinghouse type PRL-1	BAB Breakers (bolt-on)
Square D type NQOD	QOB Breakers (bolt-on)
Siemens type CDP-7	BQ Breakers (bolt-on)
General Electric Type AQ	HHQB Breakers (bolt-on)

Or equal.

2.10 SEALS

- A. Water Tight Seals
 - 1. Conduits entering from the exterior or below grade shall have water tight fittings on the outside and on the inside of the conduit.
 - a. Fittings on the outside of the conduit shall be O-Z Gedney type FSK or approved equal. Provide type WSK if penetration is within two feet of the high water table. Provide grounding attachment.

- b. Fittings on the inside of the conduit shall be O-Z Gedney type CSBI or approved equal. Provide type CSBG if penetration is within two feet of the high water table. Provide a blank fitting to seal spare or empty conduits.
 - c. O-Z Gedney type CSM fitting may be used when sealing within a sleeve or cored hole.
 2. Submit on seals to be used.
- B. Environmental Seals
 1. Provide seals on raceways exposed to widely different temperatures, as in refrigerating or cold storage areas. Install seal to prevent circulation of air from warmer to colder sections through the raceway.
- C. Hazardous Area Seals
 1. Provide explosion proof seals as required by the Electric Code.
 - a. NONE.
- D. Smoke and Fire Stopping Seals
 1. Provide a seal around raceways or cables penetrating full height walls (slab to slab), floors or ventilation or air handling ducts so that the spread of fire or products of combustion shall not be substantially increased.
 2. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods and NRTL listed products to maintain the fire resistance rating.
 3. Fire stopping in sleeves or in areas that may require the addition or modification of installed cables or raceways shall be a soft, pliable, non-hardening fire stop putty. Putty shall be water resistant and intumescent. Provide for all sleeves and raceways.
 4. Firestopping in locations not likely to require frequent modification shall be NRTL listed putty, caulk or mortar to meet the required fire resistant rating.
 5. Box penetrations into a fire rated wall or shaft shall have a fire stopping pad installed on the back of the box.
 6. Firestopping of cable trays or busways through walls shall be within a non-hardening putty or with seal bags.
 7. Firestopping materials shall be NRTL listed to UL 1479 (ASTM E814). Installation methods shall conform to a UL firestopping system. Submit specifications and installation drawings for the type of material to be used. Firestopping materials shall be as manufactured by 3M, International Protective Coatings Corp., RayChem or approved equal.

2.11 VARIABLE FREQUENCY DRIVES

- A. The variable frequency drives (VFD's) shall be solid state, with a Pulse Width Modulated (PWM) output waveform (VVI, six-step, and current source drives are not acceptable). The VFD package as specified herein shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer. The VFD shall employ a full wave rectifier (to prevent input line notching), DC Line Reactor, capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output switching device (SCR's, GTO's and Darlingtons transistors are not acceptable). The drive efficiency shall be 97 percent or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.
- B. Specifications at 208 volts:
 1. Input VAC +/-10 percent (capable of operation to 550 VAC), 3 phase, 48-63Hz. Output 0 - Input Voltage, 3 phase, 0 to 500 Hz for drives up to 75 HP; 0 to 120 Hz for drives over 75 HP. Operation above 60 Hz. shall require programming changes to prevent inadvertent high speed operation. Environmental operating conditions: 0 to 40 C @ 3 klz switching frequency, 0 to 3300 feet above sea level, less than 95 percent humidity, non-condensing. Units shall be UL, CUL and CA approved.

- C. All VFD's shall have the following standard features:
1. All VFD's shall have the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control, for stepping through the displays and menus.
 2. The VFD shall give the user the option of either (1) displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last reference revised, or (4) cause a Warning to be issued, if the input reference (4-20mA or 2-10V) is lost; as selected by the user. The VFD shall provide a programmable relay output for customer use to indicate the loss of reference condition.
 3. The VFD's shall utilize plain English digital display (code numbers and letters are not acceptable). The digital display shall be a 40-character (2 line X 20 characters/line) LCD display. The LCD shall be backlit to provide easy viewing in any angle. All set-up parameters, indications, faults, warnings and other information must be displayed in words to allow the user to understand what is being displayed without the use of a manual or cross-reference table.
 4. The VFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time.
 5. The VFD shall have the ability to automatically restart after an overcurrent, overvoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs shall count down on the display to warn an operator that a restart will occur.
 6. The VFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
 7. The VFD shall be equipped with an automatic extended power loss ride-through circuit which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be one-cycle, based on full load and not inertia. Removing power from the motor is not an acceptable method of increasing power loss ride-through.
 8. The customer terminal strip shall be isolated from the line ground.
 9. Prewired 3-position Hand-Off-Auto switch and speed potentiometer. When in "Hand", the VFD will be started, and the speed will be controlled from the speed potentiometer. When in "Off", the VFD will be stopped. When in "Auto", the VFD will start via an external contact closure, and its speed will be controlled via an external speed reference.
 10. The drive shall employ three current limit circuits to provide trip free operation:
 11. The Slow Current Regulation limit circuit shall be adjustable to 125 percent (minimum) of the VFD's variable torque current rating. This adjustment shall be made via the keypad, and shall be displayed in actual amps, and not as percent of full load. The Rapid Current Regulation limit shall be adjustable to 170 percent (minimum) of the VFD's variable torque current rating. The Current Switch-off limit shall be fixed at 255 percent (minimum, instantaneous) of the VFD's variable torque current rating. The overload rating of the drive shall be 110 percent of its variable torque current rating for 1 minute every 10 minutes, and 140 percent of its variable torque current rating for 2 seconds every 15 seconds, input line fuses standard in the drive enclosure. VFD shall have a DC Line Reactor to reduce the harmonics to the power line and to increase the fundamental power factor.
 12. The VFD shall be optimized for a 4 kHz carrier frequency to reduce motor noise and provide high system efficiency. The carrier frequency shall be adjustable by the start-up engineer in ACH 501 units. The VFD shall have a manual speed potentiometer in addition to using the keypad as a means of controlling speed manually.
- D. All VFD's to have the following adjustments:
1. Five programmable critical frequency lockout ranges to prevent the VFD from continuously operating at an unstable speed.

2. PI Setpoint controller shall be standard in the drive, allowing a pressure or flow signal to be connected to the VFD, using the microprocessor in the VFD for the closed loop control.
 3. Two programmable analog inputs shall accept a current or voltage signal for speed reference or for reference and actual (feedback) signals for PI controller. Analog inputs shall include a filter; programmable from 0.01 to 10 seconds to remove any oscillation in the input signal. The minimum and maximum values (gain and offset) shall be adjustable within the range of 0-20 MA and 0-10 Volts. Additionally, the reference must be able to be scaled so that maximum reference can represent a frequency less than 60 Hz, without lowering the drive maximum frequency below 60 Hz.
 4. Six programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoke interlocks (Enable). Upon remote, customer reset (reclosure of interlock), drive is to resume normal operation.
- E. The following operating information displays shall be standard on the VFD digital display. The display shall be in complete English words (alpha-numeric codes are not acceptable):

Output Frequency
Motor Speed (RPM, percent or Engineering units)
Motor Current
Calculated Motor Torque
Calculated Motor Power
DC Bus Voltage
Output Voltage
Heatsink Temperature
Analog Input Values
Keypad Reference Values
Elapsed Time Meter
kWh meter

- F. Speed Command Input shall be via:
1. Keypad.
 2. Two Analog inputs, each capable of accepting a 0-20mA, 4-20mA, 0-10V, 2-10V signal. Input shall be isolated from ground, and programmable via the keypad for different uses.
 3. Floating point input shall accept a three-wire input from a Dwyer photohelic (or equivalent type) instrument.
- G. Accessories to be furnished and mounted by the drive manufacturer.
1. Customer Interlock Terminal Strip-provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external interlocks and start/stop contacts shall remain fully functional whether the drive is in hand, Auto or Bypass.
 2. All wires to be individually numbered at both ends for ease of troubleshooting.
 3. Door interlocked thermal magnetic circuit breaker which will disconnect all input power from the drive and all internally mounted options. The disconnect handle shall be thru-the-door type, and be padlockable in the "Off" position.
 4. Manual transfer to line power via contactors. Include motor thermal overload and fuse or circuit breaker protection while in bypass operation. A three position selector switch to control the bypass contactor and the drive output contactor is to be mounted on the enclosure door. When in the "Normal" mode, the bypass contactor is open and the drive output contactor is closed. In the "Test" position both contactors are open, and in the "Bypass" position, the drive output contactor is open, and the bypass contactor is closed. The drive output contactor shall also open when a stop command is given, isolating the motor from the drive. Start/stop signals and safety interlocks will work in drive and bypass modes.

5. Pilot or LED's lights shall be provided for indication of "Normal" operation, "Bypass" operation, and "External Fault". All pilot lights shall be push-to-test type.
 6. Service contactor (drive input contactor) which provides the ability to service the drive (electrically isolate the drive while in bypass operation without having to remove power from the motor). The service contactor shall open when the drive is switched to bypass, and also be controlled by a switch which is mounted inside the drive enclosure so that its access is limited to service personnel only.
 7. A class 20 bimetallic thermal motor overload relay shall be provided to protect the motor in bypass.
- H. Compliance to IEEE - 519
1. The VFD manufacturer shall provide calculations specified to this installation showing that the Total harmonic Distortion for the VFD's, reflected into the electrical distribution system is limited to the level defined by IEEE - 519 (latest edition) for general systems. Harmonic analysis shall be included with VFD submittal for approval by the engineer.
 2. The VFD manufacturer shall conduct on site harmonic measurements before and after start up of the VFD's. Results of the measurements, showing harmonic contribution of the VFD's, shall be provided to the engineer one month after start up.
 3. Three phase A. C. input 3 percent line reactors shall be provided as a minimum, with all VFD's. The line reactors are to provide attenuation of line side voltage transients, thus preventing overload trips or other unnecessary V.F.D. shutdown, and provide a reduction in harmonic distortion.
 4. Line reactors shall meet the following requirement:
 - a. Three percent line impedance (external to drive).
 - b. 150 percent continuous current rating for one minute.
 - c. Saturation rating no less than 2.5 times the continuous current rating.
 - d. U.L. recognized.
- I. General: Install variable frequency drives where indicated, in accordance with manufacturer's published installation instructions, complying with recognized practices to ensure that variable frequency drives comply with requirements and serve intended purposes.
- J. Access: Provide access space around control panels for service as indicated, but in no case less than that recommended by manufacturer.
- K. Support: Install drive control panels on walls where indicated on drawings. Provide necessary Unistrut and structural steel to provide adequate support as required by manufacturer.
- L. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- M. Start-Up
1. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.
- N. Adjusting and Cleaning:
1. Alignment: Check compatibility of control panel to motor and where necessary, adjust frequency and provide necessary filters to assure noise free operation of motors. Verify response from control panel to motor to assure turn down ratio specified and that static pressure signals are

- being received and that drives are controlling as specified and within recommended tolerances by manufacturer. Provide start-up report prepared by manufacturer's representative to assure operation is as specified.
2. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- O. Owner Training: Provide four hours of owner training.

- P. Acceptable Manufacturers:
Allen – Bradley
ABB
Siemens
Square D
Or approved equal

2.12 WIREWAYS

- A. Wireway:
1. This specification covers NEMA type 1 wireway used to house and protect communication cable. The wireway system shall consist of wireway and appropriate fittings to complete the installation per the electrical drawings.
 2. Metal wireway (NEMA type 1) is to be utilized in dry interior locations only as covered in article 362 part a of the national electrical code, as adopted by the national fire protection association and as approved by the American National Standards Institute. The wiremold "c" or "sp" series is listed by underwriters' laboratories under file no. E137690 guide zoyx.
 3. The wireway system specified herein shall be the "c" or "sp" system as manufactured by the wiremold company. Systems of other manufacturers may be considered equal if, in the opinion, and the written approval of the engineer, they meet all the performance standards specified herein.
 4. The wireway and all system components must be UL Listed in full compliance with their standard ul870, "electrical wireways, auxiliary gutters and associated fittings". It shall be manufactured from 16-gauge cold rolled steel, finished in ASA 61 gray powder coat paint. All sizes larger than 6 in. x 6 in. shall be manufactured from 14-gauge cold rolled steel, finished in ASA 61 gray powder coat paint. A factory installed divider shall be available to separate power and low voltage wiring housed in the same wireway sections.
 5. A full complement of fittings for the raceway shall be available including, but not limited to, 45° and 90° flat, vertical inside and outside elbows, tee and cross fittings, couplings for joining sections of wireway, reducers, hangers, end blanks, a field installed divider and all other components necessary to make the system workable. The fittings shall have an ASA 61 gray powder coat paint finish to match the wireway.
 6. Prior to and during installation, refer to system layout drawing containing all elements of the system. Installer shall comply with detailed manufacturer's instruction sheets which accompany system components as well as complete system instruction sheets, whichever is applicable.
 7. All wireway systems shall be mechanically continuous and connected to all electrical boxes and cabinets, in accordance with manufacturer's installation sheets.
 8. All connections shall be checked to make sure they are correctly tightened and to insure that all wireway shall be electrically continuous and bonded in accordance with the national electric code for proper grounding.
 9. All wireway systems shall be installed complete. Work shall include fastening all wireway and appropriate fittings to install a complete wireway system as indicated on the electrical and/or communication drawings and in the applicable specifications.

2.13 FIRE ALARM AND DETECTION SYSTEM (EXTENSION OF EXISTING)

- A. Scope:
1. Provide extension of existing Notifier Model 640 fire alarm system as required and indicated on drawings. Provide all necessary power supplies, relays and addressable cards for work indicated on drawings.

2. Basic System Functional Operation:
When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - a. The FACP alarm LED on the FACP shall flash.
 - b. A local piezo-electric signal in the FACP control panel shall sound.
 - c. The 80-character LCD display on the local FACP node and on the intelligent network display shall indicate all information associated with the fire alarm condition, including the type of alarm point, and its location within the protected premises.
 - d. Printing and history storage equipment shall log the information associated with the fire alarm control panel condition, along with the time and date of occurrence.
 - e. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated on either local outputs or points located on other network nodes.
 - f. Program system to reflect new devices.
 - g. Test system so that alarm transmits to campus police and fire department simultaneously.
3. Software Modifications:
 - a. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes.
 - b. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm network on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

Certifications:
Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer and trained on network applications. Include names and addresses in the certification.

B. Applicable Publications:

The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

1. National Fire Protection Association (NFPA) - USA:
 - No. 72 National Fire Alarm Code
 - No. 70 National Electric Code
 - No. 101 Life Safety Code
2. Underwriters Laboratories Inc. (UL) - USA:
 - No. 50 Cabinets and Boxes
 - No. 268 Smoke Detectors for Fire Protective Signaling Systems
 - No. 864 Control Units for Fire Protective Signaling Systems
 - No. 268A Smoke Detectors for Duct Applications
 - No. 521 Heat Detectors for Fire Protective Signaling Systems
 - No. 228 Door Closers-Holders for Fire Protective Signaling Systems
 - No. 464 Audible Signaling Appliances
 - No. 38 Manually Actuated Signaling Boxes

- No. 346 Waterflow Indicators for Fire Protective Signaling Systems
 - No. 1481 Power supplies for Fire Protective Signaling Systems
 - No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
 - No. 1971 Visual Notification Appliances
3. Local and State Building Codes:
 4. All requirements of the Authority Having Jurisdiction (AHJ).
- C. Approvals:
1. The system must have proper listing and/or approval from the following nationally recognized agencies:
 - UL Underwriters Laboratories Inc.
 - FM Factory Mutual
 - MEA Material Equipment Acceptance (NYC)
 - CSFM California State Fire Marshal
- D. Conduit and Wire:
1. Conduit:
 - a. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.
 - b. Where exposed, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
 - c. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
 - d. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
 - e. Conduit shall not enter any FACP, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
 - f. Conduit shall be 3/4 inch (19.1 mm) minimum.
 - g. MC Fire Alarm Control Cable with red armor may be used for fire alarm where concealed and allowed by code.
 2. Wire:
 - a. All fire alarm system wiring must be new, unless specified herein.
 - b. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.32 mm) for notification appliance circuits.
 - c. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 - d. Wiring used for the SLC multiplex communication loop shall be twisted and shielded unless specifically accepted by the fire alarm equipment manufacturer.
 - e. All field wiring shall be completely supervised.
 3. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

- E. Intelligent Photoelectric Smoke Detector:
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density. Smoke detector shall be compatible with existing FACP model #4098-9714 with #4098-9792 base.
- F. Two Wire Detector Monitor Module:
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
 2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
 3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- G. Addressable Control Module:
1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
 2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
 3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100 percent of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
 4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
 5. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.
- H. Isolator Module:
1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
 2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
 4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
- I. Audio Visual Unit (Xenon Strobe):
1. Combination horn strobe units - Provide Truealert Non-Addressable 75 Cd, Red Sync. 2-Wire. Comprised of a 24 VDC Xenon Flash Tube entirely solid state. The unit shall require a sync. Control module. Provide True 75 Cd from all axis.

2. Combination horn strobe units - Provide Truealert Non-Addressable 110 Cd, Red Sync. 2-Wire. Comprised of a 24 VDC Xenon Flash Tube entirely solid state. The unit shall require a sync. Control module. Provide True 110 Cd from all axis.
 3. Visual only – Provide Truealert Non-Addressable 15 Cd, Red Sync. 2-Wire comprised of a 24 VDC Xenon flash tube entirely solid state.
- J. Batteries and External Charger:
1. Battery:
 - a. Batteries shall be 12 volt, Gell-Cell type.
 - b. The battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 10 minutes of alarm upon a normal AC power failure.
 - c. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills and leakage shall not be required.
- K. Field Quality Control
1. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
 2. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
 - a. Factory trained and certified.
 - b. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
 - c. International Municipal Signal Association (IMSA) fire alarm certified.
 - d. Certified by a state or local authority.
 - e. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
 3. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
 4. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
 5. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
 6. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
 7. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
 8. Final Test, Certificate of Completion, and Certificate of Occupancy:
 - a. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.
 9. Provide 4 hours of Owner training.

PART 3 - EXECUTION

3.1 WORK COORDINATION AND JOB OPERATIONS

- A. Equipment shall not be installed in congested and possible problem areas without first coordinating installation of same with other trades. Relocate electrical equipment installed in congested or problem areas should it interfere with the proper installation of equipment to be installed by other trades.

- B. Particular attention shall be directed to coordination of lighting fixtures and other electrically operated equipment requiring access which is to be installed in ceiling areas. Coordinate with other trades, the elevations of equipment in hung ceiling areas to insure adequate space for installation of recessed fixtures before said equipment is installed. Conflicts in mounting heights and clearances above hung ceilings for installation of recessed lighting fixtures or other electrically operated equipment requiring access shall be brought to the attention of Architect for a decision prior to equipment installation.
- C. Furnish to General Contractor and other subcontractors information relative to portions of electrical installation that will affect other trades sufficiently in advance so that they may plan their work and installation.
- D. Obtain from other trades information relative to electrical work which he, the Electrical Subcontractor, is to execute in conjunction with installation of other trades' equipment.
- E. Lighting fixtures in mechanical spaces or utility/ storage rooms shall only be installed after all mechanical equipment is in place.

3.2 PLANS AND SPECIFICATIONS

- A. Plans
 - 1. Drawings showing layout of electrical systems indicate approximate location of raceways, outlets and apparatus. Runs of feeders and branch circuits are schematic and are not intended to show exact routing. Final determination as to routing shall be governed by structural conditions and other obstructions.
- B. Specifications
 - 1. Specifications supplement drawings and provide specifics pertaining to methods and material to be used.

3.3 IDENTIFICATION

- A. Equipment shall be marked for ease of identification as follows.
 - 1. Provide screw-on nameplates on switchboards, panelboards, F.A. terminal cabinets, starters, and disconnect switches. Nameplates to be of black phenolic with white engraving. For starters and disconnect switches lettering shall be minimum of 1/4 in. high. Nameplates on panelboards shall have the following information.
 - a. Line 1 - Panel designation in 1/2 in. high letters.
 - b. Line 2 - Utilization voltage in 3/8 in. high letters.
 - c. Line 3 - Distribution source "Fed from " in 1/4 in. high letters.
 - 2. Neatly typed directory cards listing circuit designations shall be fastened inside the cover of panelboards. Spare circuits shall be penciled.
 - 3. Color coding schedules. If there is more than a single system voltage, different voltages shall have secondary switchboard and distribution panel and shall be of the phenolic nameplate type as previously specified. A typewritten color code schedule shall also be affixed, under plastic, inside each panelboard door.
 - 4. Outlet boxes both concealed and exposed shall be identified as to panel origination and circuit number by means of fibre pen on the inside of coverplate.
 - 5. Special system outlet boxes concealed above hung ceilings shall be identified as to system by spray painting during roughing. The following systems shall be identified.
 - a. Fire Alarm - red.
 - b. Emergency - yellow.
 - c. Sound – green

6. Wiring device plates on devices connected to normal-emergency circuits shall be red in color.
7. All conductors in boxes larger than standard outlet boxes, in all wireways, trench headers, etc. shall be grouped logically and be identified.
8. Grounding conductors and neutrals shall be labeled in panels, wireways, etc. as to circuits associated with.

3.4 PROTECTION AND CLEANUP

- A. Protection:
 1. Materials and equipment shall be suitably stored and protected from weather.
 2. During progress of work, pipe and equipment openings shall be temporarily closed so as to prevent obstruction and damage.
 3. Be responsible for maintenance and protection of material and equipment until final acceptance.
- B. Cleanup:
 1. Keep job site free from accumulation of waste material and rubbish. Remove all rubbish, construction equipment, and surplus materials from site and leave premises in a clean condition.
 2. At completion, equipment with factory finished surfaces shall be cleaned and damaged spots touched up with the same type paint applied at factory.
 3. Particular attention is called to Section 110-12(c) of the NEC, which requires that internal parts of electrical equipment not be contaminated by construction operations.

3.5 PORTABLE OR DETACHABLE PARTS

- A. Retain possession of and be responsible for spare parts, portable and detachable parts, and other removable portions of installation including fuses, keys, locks, blocking clips, inserts, lamps, instructions, drawings, and other devices or materials that are relative to and necessary for proper operation and maintenance of the system until final acceptance, at which time such parts shall be installed or turned over to the Owner, as the case may be.

3.6 SAFETY PRECAUTIONS

- A. Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

3.7 MOUNTING HEIGHTS

- A. All electrical equipment shall be mounted at the following heights unless noted or detailed otherwise on drawings. Notes on architectural drawings shall supersede those noted below or detailed on the electrical drawings. If mounting height of an electrical component is questionable, obtain clarification from Architect before installation.
 1. Duplex convenience outlets, microphone outlets, and telephone outlets - 18 inches.
 2. Light switches, pushbutton stations, HOA switches, and all other toggle or control switches for the operation of heating, ventilating, and air conditioning, plumbing, and general service - 48 inches.
 3. Fire alarm pull stations - 48 inches.
 4. Fire alarm audio visual signals - 80 inches or 6 inches below ceiling, whichever is lower.
 5. Panelboards for lighting, power, telephone, and other auxiliary systems - 78 in. to top.
 6. Equipment located in lobbies shall be located as detailed on architectural drawings or as directed by Architect.
 7. All receptacles, light switches, and fire alarm signals sharing a common location shall be symmetrically arranged.

8. Exterior and interior wall brackets shall be as detailed on architectural drawings or as directed by Architect.
- B. Mounting heights given are from finished floor to centerline. In the case of a raised floor, surface of raised floor is the finished floor.

3.8 WORKMANSHIP AND INSTALLATION METHODS

- A. Work shall be installed in first-class manner consistent with best current trade practices. Equipment shall be securely installed plumb and/or level. Flush-mounted outlet boxes shall have front edge flush with finished wall surface. No electrical equipment shall be supported by work of other trades. Cable systems shall be supported and not draped over ducts and piping or laid on ceiling suspension members. Lighting fixtures shall be installed to agree with Architects reflected ceiling plans.
- B. Supports
 1. Support work in accordance with best industry practice and by use of standard fittings.
 2. In general, walls and partitions will not be suitable for supporting weight of panelboards, and the like. Provide supporting frames or racks extending from floor slab to structure above.
 3. Provide supporting frames or racks for equipment, intended for vertical surface mounting in free standing position where no walls exist.
 4. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members, rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of equipment.
 5. General Contractor to provide 3/4 in. thick painted plywood mounting surfaces in all electric and telephone areas and for all equipment on freestanding racks. All plywood shall be fire retardant and painted both sides and edges with 2 coats of white paint.
 6. No work for exposed installations in damp locations shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of 1/4 in. air space between building surfaces and work.
 7. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric raceways or cables for support. All outlet, pull, and junction boxes shall be independently supported.
 8. Nothing shall rest on, or depend for support on, suspended ceiling or its mounting members.
 9. Support surface or pendant mounted lighting fixtures:
 - a. From outlet box by means of an interposed metal strap, where weight is less than five pounds.
 - b. From outlet box by means of a hickey or other direct threaded connection, where weight is from five to fifty pounds.
 - c. Directly from structural slab, deck or framing member, where weight exceeds fifty pounds.
 - d. Pendant lighting fixtures shall be supported by threaded rods in non-public areas and by manufacturer's standard tube hangers with swivel aligner and canopy in public areas. Provide non-standard pendant lengths where required to mount fixtures at elevations either called for on drawings or as shown in architectural elevations.
 10. Support recessed lighting fixtures directly from structural slabs, decks or framing members, by means of jack chain or air craft cable, one at each end of fixture at opposite corners.
 11. Where support members must of necessity penetrate air ducts, provide airtight sealing provisions which allow for a relative movement between the support members and the duct walls.
 12. Provide channel sills or skids for leveling and support of all floor mounted electrical equipment.
 13. Where permitted loading is exceeded by direct application of electrical equipment to a slab or deck, provide proper dunnage as required to distribute the weight in a safe manner.
 14. Support metallic raceways by either running within steel frame or hung from the building frame. Anything hung from building frame shall be attached with metallic fasteners.

C. Fastenings

1. Fasten electric work to building structure in accordance with the best industry practice.
2. Where weight applied to attachment points is 100 pounds or less, fasten to building elements of:
 - a. Wood -- with wood screws.
 - b. Concrete and solid masonry -- with bolts and expansion shields.
 - c. Hollow construction -- with toggle bolts.
 - d. Solid metal -- with machine screws in tapped holes or with welded studs.
3. Where weight applied to attachment points exceeds 100 pounds, fasten as follows:
 - a. At field poured concrete slabs, provide inserts with 18 in. minimum length slip-through steel rods, set transverse to reinforcing steel.
 - b. Where building is steel framed, utilize suitable auxiliary channel or angle iron bridging between structural steel elements to establish fastening points. Bridging members shall be suitably welded or clamped to building steel. Provide threaded rods or bolts to attach to bridging members.
4. Floor mounted equipment shall not be held in place solely by its own dead weight. Provide floor anchor fastenings. Floor mounted equipment over 72 inches in height shall also be braced to nearest wall or overhead structural elements.
5. For items which are shown as being mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging to building structural elements.
6. Fastenings for metallic raceways using the fastening as support shall be of the metallic type. Fastenings to hold raceways or cables in place may be via tyraps.

D. General Raceway Installation:

1. Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Architect for instruction for raceways which must be exposed in public spaces.
2. Raceways for normal-emergency or emergency only wiring cannot contain other conductors.
3. Raceways shall be properly aligned, grouped, and supported in accordance with code. Exposed raceways shall be installed at right angles to or parallel with structural members. Concealed raceways may take most direct route between outlets.
4. Raceways run on trapeze hangers shall be secured to the trapeze.
5. Raceways shall be continuous and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from service to all outlets. Provide grounding bushings and bonding jumpers where raceways attach to painted enclosures or terminate below equipment.
6. Where raceways enter boxes, cabinets, tap boxes, other than those having threaded hubs, a standard locknut shall be used on the outside and locknut and bushing on the inside.
7. Where raceways terminate below equipment and there is no direct metal to metal continuity, provide grounding bushings on raceways and interconnect with equipment grounding conductor.
8. All empty raceways shall be provided with a pull wire.
9. All raceway sleeves, stub-ups, or stub-outs, where not connected to a box or cabinet, shall be terminated with a bushing.
10. All raceway joints shall be made up tight and no running threads will be permitted.
11. Where raceways are cut, the inside edge shall be reamed smooth to prevent injury to conductors.
12. All vertical raceways passing through floor slabs shall be supported.
13. Raceways shall not be installed in concrete slabs above grade or below waterproofed slabs.
14. Electric raceways and/or sleeves passing through floors or walls shall be of such size and in such location as not to impair strength of construction. Where raceways alter structural strength or the installation is questionable, the structural engineer shall be contacted for approval.

15. Raceways shall not run directly above or below heat producing apparatus such as boilers, nor shall raceways run parallel within 6 inches of heated pipes. Raceways crossing heated pipes shall maintain at least a 1-inch space from them.
16. Raceways shall be installed in such a manner as to prevent collection of trapped condensates, and all runs shall be arranged to drain.
17. Where two alternate wiring methods interconnect such as EMT to flexible metal conduit, an outlet box shall be provided.
18. All empty raceways entering building and all sleeves or core drilled openings through floors shall be sealed.
19. Each exterior raceway or assembly in a ductbank shall be provided with continuous warning tape installed 12 inches above raceway or ductbank.
20. Underground rigid non-metallic raceways where allowed and run as a ductbank encased in concrete shall be installed with plastic spacers to ensure a separation of 3 inches between raceways. Top of ductbanks shall be 30 inches below grade, unless otherwise detailed.
21. Elbows and extensions of rigid non-metallic raceway systems which penetrate slabs shall be rigid or intermediate metal conduit.
22. Raceways used for transformer connections shall be flexible type and shall contain a grounding conductor.
23. Raceways entering building through foundation wall into a basement area shall be provided with wall entrance seals or with other acceptable waterproofing method.

E. General Outlet Box Installation:

1. Boxes shall be set flush with finish surface and provided with proper type extension rings or plaster covers. Thru the wall boxes are not permitted. Check device or fixture to be mounted to box to ensure box orientation is proper.
2. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operation.
3. Remove knockouts only as required and plug unused openings.
4. Where required for horizontal and vertical alignment of boxes in stud partitions, bar hangers spanning two studs shall be used. Device boxes for insertion type receptacles shall be provided with far side box supports where there are less than two entering nonflexible raceways, and where bar hangers are not provided.
5. Boxes flush mounted in fire rated partitions and on opposite sides of the partition shall be separated by a distance of 24 inches in accordance with UL listing for the box.
6. Locations of outlets indicated on drawings are approximate. For items exposed to view, refer to architectural drawings and coordinate locations with masonry joints, panel joints, ceiling grids, structural members, etc.
7. In case of conflict with standard mounting heights and device alignment, consult Architect prior to roughing.
8. Check all door swings on architectural drawings to ensure lighting switches are installed on strike side of door.
9. The right to make any reasonable change in location of outlets prior to roughing is reserved by Architect. "Reasonable change" shall be interpreted as movement within 10 feet of location shown.
10. Obtain dimensioned plan from Architect for floor outlets.
11. Outlet boxes for use where surface metal raceways are allowed shall be of a type specifically designed to be used with such surface metal raceway systems.

F. Conductor Installation:

1. No conductors shall be pulled into individual raceways until such raceway system is complete and free of debris. No harmful lubricants shall be used to ease pulling.
2. All conductors shall be wired so that grounded conductor is unbroken; switches in all cases being connected in ungrounded conductor.

3. Connections throughout the entire job shall be made with solderless type devices of approved design satisfactory to Inspector of Wires.
 4. All taps and splices shall be insulated equal to that of conductor insulation.
 5. All conductors of each feeder in pull boxes etc. shall be grouped, tied together, supported, and identified.
 6. All conductors in panelboards and other wiring enclosures shall be neatly formed and grouped.
 7. All conductors of emergency only shall be run in separate raceway systems to final outlet box.
 8. Provide support for conductors in vertical raceways in accordance with Article 300-19.
 9. Strip insulation from conductors with approved tools and only of sufficient length for proper termination. Cutting of conductor stranding is unacceptable.
 10. Taps from paralleled conductors shall be of a type which tap each conductor, such as ILSCO "PTA" series.
 11. Grounding conductors are to be identified as to associated power circuits.
- G. Type MC Cable Installation:
1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
 - a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Horizontally run cable supports such as Caddy WMX-6, and clamps on vertical runs such as Caddy CJ6 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will also be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of types specifically designed for use with cable, i.e., romex connectors not acceptable.
 - b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co., not with hacksaw.
 - c. Use split "insuliner" sleeves at terminations.
 - d. Any cable system used in conjunction with isolated ground circuits shall have both an isolated ground conductor and an equipment ground conductor.
- H. Stranded Conductor Installation:
1. If Contractor selects stranded conductors for # 10 AWG and smaller, terminate such conductors as follows:
 - a. No stranded conductor may be terminated under a screwhead. Provide insulated terminal lugs for all screw connections equal to Thomas & Betts "STA-KON" type RC with forked tongue and turned up toes. Installation of lugs shall be done with compression tool such as T&B WT-145C which prevents opening of tool until full compression action is completed.
 - b. Backwired wiring devices shall be of clamp type; screw tightened. Force fit connections not allowed.
 2. Stranded conductors will not be allowed for fire alarm work.
- I. Accessibility:
1. Electrical equipment requiring service or manual operation shall be accessible.
 2. Work switches for equipment within accessible hung ceiling spaces, such as fan powered terminal boxes, shall be located at terminal box, and so located so as to be accessible.
- J. Vibration Elimination:
1. All equipment connections to rotating equipment or equipment capable of vibration shall be made up by flexible raceways.
- K. Wiring Device Gaskets:
1. Provide wiring device gaskets at coverplates where device is mounted in wall separating conditioned and non-conditioned spaces.

3.9 FEEDER CIRCUITS

- A. Provide feeders as called for on the drawings.
- B. Feeders shall be defined as any circuit originating from the main building switchboard and/or distribution panels.
- C. All feeder conductors shall be continuous from origin to panel or equipment termination without splicing.
- D. All feeders shall be conductors pulled into raceways. Cable systems are not allowed for feeders unless specifically indicated.

3.10 BRANCH CIRCUITS

- A. Provide all branch circuit wiring and outlets for a complete and operating system. The system shall consist of insulated conductors connected to the panelboards and run in raceways or as cable systems if permitted under products section, as required to the final outlet and shall include outlet boxes, supports, fittings, receptacles, plates, fuses, etc.
- B. Physical arrangement of branch circuit wiring shall correspond to circuit numbering on drawings. Combining of circuits and raceways will be allowed up to a 3 phase, 4 wire circuit in a single raceway, unless shared neutrals are not allowed by other sections of this Division, or are indicated as separate neutrals on the drawings. All receptacle circuits shall have dedicated neutrals. Any combination of homeruns such as this, however, shall be indicated on record drawings. Combining of conductors and raceways for tenant fitup work is allowed only for fitup boxes in accordance with details on drawings. When a common grounded conductor is used for more than one circuit, the arrangement shall be such that a receptacle, fixture, or other device may be removed or disconnected without disconnecting the grounded conductor for other circuits. Ground fault circuit breakers and isolated ground outlets shall be wired with separate neutrals and separate grounding conductors per circuit. A consistent phase orientation shall be adhered to throughout project at terminations.
- C. Circuits feeding three phase equipment shall not be combined into common raceways, unless specifically indicated.
- D. All wiring in panelboards and cabinets shall be neatly formed and grouped.

3.11 FIREPROOFING AND WATERPROOFING

- A. Fireproof and waterproof all openings in slabs and walls.

3.12 CUTTING AND PATCHING

- A. All cutting of surfaces, including core drilling of walls and slabs as called for on 1.2.B.8 shall be done by Electrical Subcontractor. Openings through new wall surfaces will be provided by General Contractor if Electrical Subcontractor gives suitable notice as erection of surface proceeds. If suitable notice is not given, Electrical Subcontractor shall then be responsible for cost of corrective work required.
- B. Patching will be provided by the trade responsible for the surface to be patched.

3.13 MECHANICAL SYSTEM COORDINATION

- A. The Mechanical System Subcontractor will be providing various items of mechanical services equipment and control apparatus. In general, Electrical Subcontractor shall provide disconnecting means and connect up power wiring to this equipment.
- B. The Mechanical and Electrical Subcontractor shall closely coordinate their respective portions of work.
- C. If, due to local regulations, electric heating equipment furnished by the mechanical systems subcontractor is required to be installed by licensed electricians in order to allow connection by Electrical Subcontractor's licensed electricians, it will then be Mechanical Subcontractor's responsibility to engage and pay for services of such licensed electricians.
- D. Power wiring to be provided by Electrical Subcontractor is the line voltage power supply wiring. Control wiring is responsibility of Mechanical System Subcontractor. Temperature Control Subcontractor shall refer to electrical drawings for location of all magnetic starters provided by the Electrical Contractor.
- E. One 120 volt control wiring source to (1) temperature control panel is the responsibility of Electrical Subcontractor. Coordinate location in field.

END OF SECTION