DOCUMENTS AND SPECIFICATIONS

FOR

PHASE 2: HVAC REPLACEMENTS
AT
HYANNIS WEST ELEMENTARY SCHOOL

TOWN OF BARNSTABLE

Bidding Documents

September 25, 2017

CBI Consulting Inc.

250 Dorchester Avenue
Boston, Massachusetts 02127
(617) 268-8977
Fax (617) 464-2971
cbi@cbiconsultinginc.com

CBI FILE NUMBER 13165-G

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

HVAC REPLACEMENTS AT
HYANNIS WEST ELEMENTARY SCHOOL **# OF PAGES**

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

SECTION 00 85 01 –DRAWING LIST

GENERAL		
G0-01	COVER SHEET	24” X 36”
MECHANICAL		
M1-01	MAIN FLOOR HVAC - DEMO PLAN	24” X 36”
M1-02	MAIN FLOOR HVAC - NEW WORK PLAN	24” X 36”
M2-01	HVAC SCHEDULE, DETAILS & CONTROLS	24” X 36”
ELECTRICAL		
E1-01	ELECTRICAL SYMBOLS, SCHEDULES, DETAILS	24” X 36”
E1-02	MAIN FLOOR - ELECTRICAL PLAN	24” X 36”

END OF SECTION

Hyannis-West Elementary School
Phase 2: HVAC Replacements
Barnstable, Massachusetts
CBI JOB NO.: 13165-G

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

TECHNICAL SPECIFICATIONS

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 10 00 SUMMARY OF WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 DESCRIPTION OF WORK - GENERAL

A. In general, the Contractor shall supply all material, labor, equipment, insurance, temporary protection, tools and appliances necessary for the proper completion of the work as described in the Plans and Specifications, in accordance with good construction practice, and as required by the materials manufacturers.

B. Supply all shoring and protection necessary to protect the occupants, building area, building systems, and landscape areas. All means and methods are the responsibility of the contractor. The Contractor is solely responsible for safety on the job site.

C. The work includes, but is not limited to:

1. General:

a. Protect interior finishes and furnishings from the work. Repair and replace damaged materials to the complete satisfaction of the Owner.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2. Immediately upon signed contract, submit project schedule for review and approval. The work shall not take place during school hours. All work shall occur during scheduled off-hours, evenings, weekends and school vacations while facilities staff are present. Coordinate all work with the School Department in advance of scheduling the work. The work shall be Substantially Complete by February 24, 2018.

3. The Base Bid Scope of Works includes the removal of Type 'A' Unit Ventilators in the Classrooms only, to accommodate the unit ventilator replacement where indicated on M1-02. Provide and Install Unit Ventilator Type 'A' Replacements including outside air duct sleeves and a full sheet metal back plate.

4. **ADD ALTERNATE #1** Work includes the removal and disposal of all other Unit Ventilators indicated on the Drawings that are not part of the Base Bid, and provide and install unit ventilator replacements as scheduled on the Drawings. Refer to Mechanical Drawings and Specification and Electrical Drawings. For units in the ceiling, carefully remove and store suspended acoustical ceiling tiles and grids in order to access the work above the ceiling and complete the work. Re-install all ceilings upon completion of the work. Any damage to existing materials and finishes to remain shall be repaired or replaced to the complete satisfaction of the Owner, and at no additional cost to the Owner.

5. Provide new standalone thermostat/CO2 for all new unit ventilators.

6. Remove and dispose of all existing HVAC systems and equipment shown on the Drawings as required to complete the work of the Contract.

7. Provide and install Firestopping Sealant at all of the full-height walls and floor slabs where pipes have been removed and at new penetrations.

8. Provide 1" rigid board insulation on outside air ductwork

9. The unit ventilator manufacturer shall be required to provide a factory piped return condensate drain pipe from the left hand coil connection to the right hand end pocket for connection to the existing condensate return pipe. This pipe shall be sloped to facilitate draining. Provide 1/2" foam insulation on this cross over piping.

10. The existing unit ventilators and air handling unit do have isolation valves, however, per the contract documents, new isolation valves are required and therefore boiler shutdown will be required.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.03 INTENT OF THE PROJECT MANUAL

A. Whenever "Furnish", "Install", or "Provide" is used in the Contract Documents, it shall mean to erect, install, connect, make operative, and supply all labor and materials, including miscellaneous fittings, hardware, and accessories necessary to complete the installation of the specified item.

B. The scope of work is indicated in the Project Manual. Areas of required work indicated on the drawings are for illustration and are not to be interpreted as representing quantities, exact locations, and/or the extent of work required. The Owner makes no representation of the exact quantities of work required. It shall be the responsibility of the Contractor to do all work to the complete fulfillment of the requirements of the Project Manual.

1.04 ERRORS, OMISSIONS, AND CONFLICTS IN THE PROJECT MANUAL

A. In the case of conflicts in the Drawings and the Specifications noticed by the Contractor, the Architect shall be notified immediately in writing of such errors and/or omissions. In no case shall the Contractor proceed without written authorization from the Architect.

1.05 UNFORESEEN FIELD CONDITIONS

A. In the case of unforeseen field conditions, the Contractor shall notify the Owner and Architect immediately in writing of such conditions. In no case shall the Contractor proceed without written authorization from the Architect. If such unforeseen conditions result in additional expense, the Contractor shall not proceed without the written approval of the Owner.

1.06 CORI FORM

A. Each employee of the Contractor that will be present on the project site must be approved by the Barnstable Public Schools prior to accessing the site. Approval requirements include filling out a CORI form. The CORI form must be submitted to the Barnstable Public Schools for approval. Note that the Barnstable Public Schools CORI representative will conduct a criminal background check. Any employee who has not been approved by the Barnstable Public Schools CORI representative will not be allowed at the project site. CORI checks to be approved.

B. The CORI representative will provide the Contractor with forms of identification for each employee of the Contractor that are cleared and authorized to be on site.

C. A copy of each employee's identification card must be readily visible at all times throughout construction activities.

D. No employee of the Contractor shall have any contact with any student at any time while on school premises.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 24 00 SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 BIDDERS EXAMINATION AND INSPECTION OF EXISTING BUILDING AND SITE

A. All bidders must inspect the existing site and make their own assessment of the work required to achieve the complete, finished conditions specified in the Contract Documents.

B. Failure to adequately inspect the site and/or correctly assess existing conditions shall not be cause for additional payment.

C. Every contractor will be bound by the scope of work of the Contract Documents and shall make the inspections necessary to assure that the bid price includes the complete scope.

1.03 HOURS OF WORK

A. Work shall be completed only while school is not in session. Work may commence at 4:00 P.M. and continue until 10:00 P.M., Monday through Friday. Work may be allowed at other times with advance written request and subject to

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

approval by the Owner. The Contractor shall be responsible for paying for school facilities staff to work overtime to keep the building open during off-hours. The Owner will not be responsible for paying any Contractor overtime to complete the work.

B. The contractor shall be completely and fully responsible for the security and safety of the job site at all times.

1.04 CONTRACTOR USE OF THE BUILDINGS, ACCESSIBILITY AND SCHEDULES FOR WORK

A. The work of the Contractor and all Subcontractors shall be performed during the hours of operation as specified herein and in and around areas of the building and site used while occupied by the Owner and the public. The Contractor shall execute the Work with the least possible disturbance to the use and continuous functioning of the site and building. The Contractor and each Subcontractor take all necessary measures to assure the safety of the staff, visitors, and the general public. The General Contractor is solely responsible for safety on the job site including securing and making safe all construction areas during construction hours as well as during non-construction hours.

B. Schedule of Work and Site Use

1. The Contractor shall schedule the work of this Contract so as to perform and complete the Work of the Contract according to the following schedule. The Contractor shall within seven (7) days of the Notice of Contract Award, submit a schedule to the Owner and Architect for review.

2. Between the time period of the general bid due date and Construction Commencement, the Contractor shall take all necessary measures to complete the Work of this Contract. It is expected that the Contractor utilize the time period between the bid date and construction start date to schedule and coordinate the work and work sequence, prepare shop drawings and submittals for approval and order materials. The Owner shall issue a Notice to Proceed. If the work is not complete by the completion date, the Contractor will be subject to liquidated damages.

3. The Contractor shall be responsible for providing any and all measures and/or temporary construction required to control the transmission of dust, particles, and fumes from construction activities.

4. The Contractor shall be responsible on a daily basis for informing the designated Owner’s representative of all persons on-site that day associated with the Work. The Contractor shall establish a daily reporting system of all activities which is acceptable to the Owner.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

5. The Construction schedule shall indicate the dates for start and completion of each work item or task required with all milestones using a Bar Chart subject to approval by the Architect.

6. The Awarding Authority's review of the project construction schedule shall not extend to the accuracy or other matters dealt with in the schedule, including but not limited to whether work is omitted, whether duration of activity is reasonable, the level of labor, materials or equipment, the Contractor's means, methods, techniques, procedures or sequence of construction, or whether the sequence and timing for work remaining are practical. The accuracy, correctness of all work, sequencing, and schedules shall remain the sole responsibility of the Contractor. Neither the Awarding Authority's review of a schedule nor a statement of resubmittal not required shall relieve the Contractor for the responsibility for complying with the contract schedule, adhering to sequences of work, or from completing any omitted work with the Contract Time.

7. The Contractor shall provide, erect and maintain barricades with any required egress, access doors, lighting, ventilation, guard rails and all other appurtenances required to protect the general public, visitors, staff, and workers while construction is in progress. Safety is the sole responsibility of the Contractor on the job site.

1.05 HOUSEKEEPING AND PROTECTION OF EXISTING CONDITIONS

A. Maintain the premises in a safe, orderly condition at all times. Protect construction, furnishings, equipment and other items.

B. Property Protection: The General Contractor shall take all measures necessary to protect the Owner's property.

C. Security: The General Contractor shall take every possible precaution to maintain the security of the buildings and site. The Contractor shall cooperate with the Owner fully and follow the Owner's directions as issued. The Contractor shall control and restrict access to areas of work to prevent injury to persons and property.

D. The Contractor shall properly cover, protect and maintain floor and finished surfaces to prevent damage. Replace protective coverings which become wet, torn or ineffective.

E. Finished Surfaces Protection:

1. The Contractor shall restrict traffic on finished surfaces to perform the work of this Contract and permit traffic only required to properly complete the Work.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2. Effectively protect surfaces to prevent damages to existing substrates, and new finishes. Provide temporary walkways and work platforms as needed.

3. Load distribution: The Contractor and any Subcontractor shall not load or permit any part of the structure to be loaded in any manner that will damage the existing structure or endanger the safety of persons or property. Such loads shall include live and dead loads and all moving, vibratory, temporary and impact loads.

F. Correction by the Contractor

1. At no additional cost to the Owner, the General Contractor shall immediately correct all deficiencies, including damages to the building, site and site surfaces, damages to furnishings, damages to equipment or systems, damage to adjacent properties, and all other damage caused by the General Contractor or its Subcontractors during the execution of the Work of this Contract. Any and all damages resulting from inadequate, insufficient or defective temporary protections installed by the Contractor during the work of this Contract, shall be corrected by the General Contractor at no additional cost to the Owner.

1.06 REQUIREMENTS RELATED TO BUILDING USERS' FURNISHINGS, EQUIPMENT AND OTHER ITEMS

A. The General Contractor is responsible for protecting all furnishings, equipment and items from damage (including construction generated dust) during the entire construction period.

B. The General Contractor shall be responsible for moving and re-setting up all furniture, fixed and movable equipment, file and storage cabinets, recreation equipment, boxes, and all other items to accomplish the work of both the General Contractor and the Subcontractors in its entirety.

1.07 DUST, DIRT, AND FUME CONTROL

A. The Contractor shall take all necessary precautions and provide all necessary temporary construction to effectively contain dust, dirt and fumes within the areas of work and within the work limits. Temporary construction shall be provided to effectively prevent dust and dirt from entering areas of the buildings or adjacent buildings, satisfying all City, State and Federal laws, codes, and requirements.

1.08 RUBBISH REMOVAL

A. The Contractor shall remove all rubbish, waste, tools, equipment and appurtenances caused by and used in the execution of the Work; but this shall in

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

no way be construed to relieve the Contractor of his primary responsibility for maintaining the building and Project site clean and free of debris, leaving all work in a clean condition and satisfactory to the Official.

B. Immediately after unpacking, the Contractor shall collect and remove from the building and Project site all packing materials, case lumber, excelsior, wrapping and other rubbish.

C. Rubbish removal shall occur so that trash and debris are contained in closed and secured waste containers.

1.09 SITE DRAINAGE AND PUMPING

A. The Contractor shall be responsible at all times for proper and sufficient site drainage and shall maintain such drainage during the life of the Contract in a manner acceptable to the Owner and so as not to adversely affect the adjacent areas or adjacent properties.

B. The Contractor shall provide and maintain all pumps, suction and discharge lines, and power in sufficient number and capacity to keep all excavations, pits, trenches, foundations and the entire property area free from accumulation of water from any source whatsoever at all times and under way and all circumstances and contingencies that may arise.

1.10 SNOW AND ICE REMOVAL

A. The Contractor shall promptly remove all snow and ice which may impede the work, damage the finishes or materials, be detrimental to all/any crafts or trade, or impede trucking, delivery or moving of materials at the site, or prevent adequate drainage of the site or adjoining areas.

1.11 WINTER CONSTRUCTION

A. The Contractor shall provide protection against damage to materials and work installed in freezing weather, including special heat and coverings to prevent damage by the elements. Therefore, the Contractor is completely responsible for any and all winter conditions protection, including but not limited to: The ground surface, under footings, under pipe lines, under masonry, under concrete, and other work subject to damage shall be protected against freezing or ice formations.

B. Refer to SECTION 01500--TEMPORARY FACILITIES, for additional requirements applicable to winter construction.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.12 BROKEN GLASS

A. The Contractor shall be held responsible at all times prior to Substantial Completion of the Work, or occupancy by the City, whichever occurs first, for all broken or scratched glass, or glass which had been damaged as a result of the Work, or otherwise. And, when so directed by the Official, the Contractor shall replace at no increase in Contract Price or Contract Time, all such glass broken, missing, or damaged prior to Substantial Completion.

1.13 CLEANING AND POLISHING

A. The Contractor shall at all times keep the building and Project site free from accumulation of waste materials or rubbish.

B. Immediately prior to final inspection, the entire building and surrounding Project areas shall be thoroughly cleaned by the Contractor including, without limitation:

1. All construction facilities, tools, equipment, surplus materials, debris and rubbish shall be removed from the Project site and the entire Work shall be left broom clean.

2. All finished surfaces shall be left in perfect condition, free of stains, spots, marks, dirt, and other defects. The Contractor shall be responsible for the cleaning and polishing of the Work of all trades, whether or not cleaning by such trades is included in their respective Selection of the Specifications.

3. All glass in the building shall be washed and polished on both sides.

4. All metals, hardware, fixtures, and equipment shall be left in undamaged, bright, polished condition.

5. Plenums, duct spaces and furred spaces shall be protected at all times from fumes, particles and other air-borne construction effects. These building spaces shall be left clean of debris and decayable materials.

6. Equipment and building systems located in areas of construction shall be cleaned and tested and made perfectly operational to the satisfaction of the Owner prior to Substantial Completion or partial Substantial Completion of that area of work.

C. In cleaning items having manufacturer’s finish, or items previously finished by a Subcontractor, care shall be taken not to damage such finish. In cleaning glass and finish surfaces, care shall be taken not to use cleaning agents which may stain or damage any finish materials. Any damage to finishes caused by cleaning

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

operations shall be corrected and repaired by the Contractor at no increase in Contract Price.

1.14 OR-EQUAL

A. Where materials, equipment, apparatus, or other products are specified by Manufacturer, brand name, type or catalog number, such designation is to establish standards or performance, quality, type and style.

B. If the General or Subcontractor wishes to use materials or equipment other than these specifically designated herein, as being equal to those so specifically designated, he shall submit the proposed substitution before purchasing and/or fabrication in accordance with the requirement of the General Conditions for approval.

C. It is the responsibility of the Contractor to submit all back-up material and data needed to prove that the proposed product is an “or-equal”. The Architect will not review an alternative product without proper documentation. Alternative products and assemblies will be rejected immediately without proper documentation.

D. The schedule of the project is not subject to the availability of products submitted as “or approved equal” or the review needed to certify an “or approved equal” product.

1.15 PERMITS, POLICE DETAILS, AND FIRE WATCHES

A. The contractor is responsible for procuring and paying for all applicable permits, fire watches, and police details throughout the entire project.

1.16 COORDINATION

A. The Contractor shall coordinate locations of all items to be installed with the Architect. If an item is not dimensioned, for height or location, contact the Architect for the installation information. Installation of items without the proper dimensional information may result in reinstallation at no additional charge by the contractor.

1.17 GENERAL NOTES

A. CONTRACTOR SHALL BE RESPONSIBLE FOR CHECKING AND COORDINATING ALL DIMENSIONS WITH ARCHITECTURAL DRAWINGS. IN CASE OF CONFLICT, THE ARCHITECT SHALL BE NOTIFIED AND SHALL RESOLVE THE CONFLICT.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

B. IN ANY CASE OF CONFLICT BETWEEN THE DRAWINGS AND THE PROJECT SPECIFICATIONS, THE MORE STRINGENT REQUIREMENTS SHALL GOVERN.

C. THE CONTRACTOR SHALL MAKE NO DEVIATION FROM DESIGN DRAWINGS WITHOUT PRIOR REVIEW BY THE ARCHITECT.

D. WORK NOT INDICATED ON A PART OF THE DRAWINGS BUT REASONABLY IMPLIED TO BE SIMILAR TO THAT SHOWN AT CORRESPONDING PLACES SHALL BE REPEATED.

E. ALL WORK SHALL COMPLY WITH APPLICABLE CODES AND LOCAL LAWS AND REGULATIONS.

F. GENERAL CONTRACTOR SHALL COORDINATE LOCATIONS OF OPENINGS, PITS, BOXES, SUMPS, TRENCHES, SLEEVES, DEPRESSIONS, GROOVES, AND CHAMFERS, WITH MECHANICAL, ELECTRICAL AND PLUMBING TRADES.

G. THE STRUCTURAL DESIGN OF THE BUILDING IS BASED ON THE FULL INTERACTION OF ALL ITS COMPONENT PARTS. NO PROVISIONS HAVE BEEN MADE FOR CONDITIONS OCCURRING DURING CONSTRUCTION. IT IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO MAKE PROPER AND ADEQUATE PROVISIONS FOR STABILITY OF, AND ALL STRESSES TO THE STRUCTURE DUE TO ANY CAUSE DURING CONSTRUCTION.

H. CONTRACTOR SHALL NOT SCALE DRAWINGS. CONTRACTOR SHALL REQUEST ALL DIMENSIONS OR INFORMATION REQUIRED TO PERFORM THE WORK FROM THE ARCHITECT. WORK COMPLETED BY THE CONTRACTOR WITHOUT DIMENSIONS OR INFORMATION SHALL BE DONE AT THEIR OWN RISK AND, IF DEEMED INCORRECT BY THE ARCHITECT, SHALL BE REMOVED AND REINSTALLED TO THE SPECIFICATIONS OF THE ARCHITECT AT NO ADDITIONAL COST TO THE OWNER.

I. CODES: THE PROJECT IS BASED ON THE REQUIREMENTS OF THE MASSACHUSETTS STATE BUILDING CODE - CURRENT EDITION.

J. THE PLANS WERE COMPILED FROM VARIOUS SOURCES. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS AND DIMENSIONS.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.19 INSURANCE

A. The Contractor shall purchase and maintain, at his expense all insurance required by the Contract. Documents and all insurance required by the applicable laws of Massachusetts, including but not limited to, General Laws, Chapter 146, in connection with all hoisting equipment.

B. The Contractor shall purchase and maintain such insurance as will protect him from claims under workmen's compensation acts and from claims for damages because of bodily injury, including death and all property damage including, without limitation, damage to buildings and adjoining the site of construction which might arise from and during operations under this contract, whether such operations be by himself or by any subcontractor or anyone directly or indirectly employed by either of them including:

1. Statutory Worker's Compensation and Employer's Liability

   The contractor shall provide insurance for the payment of compensation and the furnishing of other benefits under Chapter 152 of the General Laws (so-called Worker's Compensation Act) to all persons to be employed under this contract and shall continue in force such insurance as aforesaid shall be deemed a material breach of this Contract and shall operate as an immediate termination thereof. The contractor shall, without limiting the generality of the foregoing, conform to the provisions of Section 34A of Chapter 149 of the General Laws, which Section is incorporated herein by reference and made a part of hereof.

2. Comprehensive General Liability Insurance

   Minimum bodily injury limits of $ 500,000 per person and $ 1,000,000 per accident, and property damage limits of $ 500,000 per accident and $ 1,000,000 aggregate during any 12 month period, shall include the following:

   a. Public liability (bodily injury and property damage)

   b. X.C.U. (explosion, collapse, and underground utilities)

   c. Independent contractor's protective liability.

   d. Products and completed operations.

   e. Save harmless agreement for Owner and Architects set forth in ARTICLE 10.11 of the GENERAL CONDITIONS.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3. Comprehensive All Risk Motor Vehicle Liability Insurance

   Minimum bodily injury limits of $ 500,000 per person, $ 1,000,000 per accident, and property damage limit of $ 1,000,000 per accident.

4. All Risk Insurance

   Covering all Contractor's equipment with a provision for Waiver of Subrogation against the Owner.

5. Excess Liability Insurance in Umbrella Form with combined Bodily Injury and Property Damage Limit of $ 1,000,000.

6. Town of Barnstable and CBI Consulting Inc. shall be listed as Additional Insured with a Waiver of Subrogation on the insurance policy for this project.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 25 00 CONDUCT OF THE WORK

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 PROJECT MANAGEMENT

A. The Contractor's attention is directed to the General Conditions.

B. The Building will be occupied during construction. The Contractor will have complete control of the job site and is solely responsible for safety and security on the job site. The Contractor shall take all necessary precautions to ensure the public safety and convenience of the visitors during construction.

C. The work must be completed in a continuous uninterrupted operation. The Contractor must use sufficient personnel and adequate equipment to complete all the necessary work requirements within a minimum period of time.

D. Unless specifically authorized by the Owner, in writing, the work must be conducted between the hours of 4:00 p.m. and 10:00 p.m. on Monday through Friday. No work is to be done on holidays or Sundays unless approved by the Owner in advance.

E. The Contractor is responsible for the security and stability of partially completed work until the project is accepted by the Owner.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.03 SHUTDOWN OF SERVICES

A. If site utility services to the neighborhood are cut by the contractor, he shall supply all labor, materials or whatever may be required to supply said temporary utility services at no extra cost to the neighborhood and in accordance with the state and local regulations on health and safety, working around the clock, until they are reinstated. The contractor shall also repair the damaged utility immediately at no cost to the owner.

1.04 COORDINATION

A. The Contractor shall submit for approval to the Owner a detailed operational plan showing the sequence of operations prior to commencement of any work at the site. Any changes to this operational plan must be approved by the Owner.

B. The Contractor must retain on the Work during its progress a competent full time representative, satisfactory to the Owner. This representative shall not be changed, except with the consent of the Owner. The representative shall be in full charge of the work and all instructions given to this person by the Architect shall be binding.

C. The Contractor must supply to the Owner the home telephone number of a responsible person who may be contacted during non-work-hours for emergencies on the Project.

1.05 OWNER'S COOPERATION

A. The Owner shall assist the Contractor to perform the Work in accordance with the approved operational plan.

B. The Contractor shall provide:

1. Notification to the Owner two (2) weeks before any work is scheduled at the site/building.

2. Notification to the Owner in writing forty-eight (48) hours before work is scheduled in any particular area.

3. An updated schedule monthly with the application for payment. Payments will not be authorized until the updated schedule is received and approved.

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 26 00 COORDINATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 COORDINATION WITH BUILDING PROCEDURES

A. The safety and welfare of the patrons, faculty, employees, and guests of the Town of Barnstable are the utmost concern of the project. All work by the Contractor, his Sub-Contractors, Sub-Bidders, suppliers, and employees shall be performed in a way that will safeguard this concern. Safety is the sole responsibility of the Contractor on the jobsite. Extraordinary care must be taken throughout the project to coordinate work activities with school schedules, procedures, and activities.

B. The General Bidder, and all the sub-contractors are hereby notified that there is enough time, in advance of mobilization on site, for all the products to be procured ahead of the work, for this project. Please also take note of Section 01300.1.05.A which indicates that a Schedule of Shop Drawings must be submitted within 10 days of the Date of Commencement. It is expected that all the long lead time items will have shop drawings prepared immediately and that all the long lead time products will be ordered as soon as possible so that the progress of the work is not affected nor will the schedule be compromised by delivery schedules. Stored material will be paid for by the Owner upon receipt of Certificates of Insurance, Transfer of Title, and inspection by the Architect.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

Coordinate all site visits with the Owner PRIOR to arriving at the site. No access will be allowed without approval in advance.

C. All construction activities and deliveries to the site are to be coordinated with the Town's Project Representative.

D. Pre-construction meetings shall be held with the Building administration, the Contractor and Architect, to coordinate locations for dumpsters and chutes, deliveries, worker parking, material storage, as well as to discuss safety, scheduling, procedures, and to emphasize 1.02.A, above.

E. Contractor shall restrict hazardous items and activities to locations that will have the least impact on the daily operations of the schools and the other buildings. All material storage, locations of cranes, dumpsters, workers access, etc. will be only in areas approved by the Town of Barnstable.

F. Install, at a minimum, when work is performed overhead, covered walkway protection at all entrance and exit doors, at areas of construction, to the facility during construction activities, 10'-0" minimum length, of pipe scaffolding, plywood, planking, orange plastic fencing, and yellow safety tape. Safety is the sole responsibility of the contractor, regardless of the information in this specification.

G. Contractor shall cover all interior spaces where work will occur, with minimum 6-mil poly tarps before operations commence above to protect interior surfaces and equipment from debris and dust. All protections shall be removed immediately upon completion of the work. Dust and debris not contained by the tarps shall be immediately vacuumed to the satisfaction of the Town of Barnstable. Damage as a result of the work will be repaired to the satisfaction of and at no additional cost to the owner.

H. Contractor shall provide signage and other safety barriers at the site adequate to support their safety program.

I. Contractor shall update the Construction schedule monthly. Requisitions for payment must be accompanied by an updated schedule. The on-site superintendent shall meet with the Town's project representative daily at 2:00 PM to inform them of the daily progress and review the schedule for the next three (3) days.

1.03 CORI REQUEST FORM

A. All personnel working at the sites will be required to fill out a Town of Barnstable CORI request form, which is included after this section.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1. All forms shall be submitted to Town of Barnstable one week prior to the applicant being on site.

2. The General Contractor will update the list as required to reflect current workers on site.

3. All workers must pass the CORI background check in order to work on this site.

B. The General Bidder, all the File Sub-Bidders, and all the sub-contractors are hereby notified that CORI checks are required for all personnel that will be working on site at any of the Town of Barnstable properties. It is each individual contractor's responsibility to submit the required paperwork to the State, in advance of the work, so as not to delay the schedule for any possible employee that will access the site. Approval by the state for must be delivered to the Owner in advance of the work. Payments will be withheld to the contractor if he/she fails to submit the proper CORI certifications in advance of the work.

1.04 SCHEDULING

A. Time is of the essence in this project.

B. Temperature is a critical factor in the construction work. Adhere to manufacturer's specifications.

C. Within five (5) days after the Contractor has received the Owner's Notice to Proceed, and before the commencement of any work, the Contractor shall transmit the proposed construction schedule to the Owner and Architect for review. If any change in the work will alter agreed upon schedules, the Contractor shall immediately notify the Owner and Architect in writing.

D. The Contractor shall confine his/her apparatus, storage of materials, and operation of his/her workmen to limits as required by the Owner, and shall not unreasonably encumber the premises with these materials. He/she shall keep all access roads and walks clear of construction equipment, materials, and debris of any kind. He shall repair any and all damage to access roads, walks, the building facade and roof caused by construction operations, and leave them in at least as good condition as originally found. All operations shall be confined within the property. All delivery and construction operations shall be conducted so as to avoid all possible obstruction of the work and building operations. The Contractor shall meet regularly with the Owner to coordinate the use of the Site.

E. The Contractor must request approval from the Town of Barnstable and the Railroad Museum to work after hours, overnight, or on Saturdays at no additional expense to the owner. No work can be performed on Sunday.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.05 SUBCONTRACTORS

A. Subcontractors are subject to approval by the Owner.

1.06 CONSTRUCTION REVIEW

A. All materials and workmanship shall be subject to review by the Architect and all designated representatives of the Owner. Such review may take place at any time during the construction, and wherever work relating to this project is underway. The Contractor shall notify the Architect of any approaching stage of the work likely to require his/her attention, and the Architect shall have the right to reject all defective or non-conforming workmanship and material, and to require its replacement.

B. If any unreviewed work is covered up without approval, the Contractor shall bear the costs of uncovering it upon request.

1.07 CODES

A. Codes, standards, and publications of private and public bodies mentioned in these specifications, and other such standards and specifications, refer to the latest edition thereof at the time of taking bids unless a specific edition is designated, and shall be considered and integral part of the Contract Documents.

1.08 COORDINATION OF WORK

A. Contractor shall coordinate all construction work with Town's Project Representative and the Head Librarian.

B. Contractor is responsible for all building and sidewalk permits, police details as required as well as any other requirements that may be imposed by the Town of Barnstable.

1.09 SPECIFICATION DISTRIBUTION TO WORKMEN

A. A complete copy of the project manual, including plans and specifications shall be kept at the construction site at all times.

B. At the direction of the Architect, the Contractor shall photocopy various parts of pertinent Sections of the Project Manual to be handed out to each tradesman.

1.10 FIELD MEASUREMENTS

A. Before ordering any materials or performing any work, the Contractor or his/her subcontractors shall inspect all existing conditions and perform all measurements at the building. No extra charge or compensation will be allowed because of differences between the drawings and the actual dimensions. Any differences

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

between the Project Manual and the actual conditions found shall be submitted to the Architect for his/her decision before proceeding with the work.

1.11 CUTTING AND PATCHING

A. The work to be performed under this Contract shall include all cutting and patching necessary to accommodate new work.

1.12 PERMITS

A. All fees and procurement of building permits shall be the responsibility of the Contractor. Requests for inspections by the Building Inspector and the obtaining of required signatures by Inspection on permits is the responsibility of the Contractor.

1.13 DUMPING

A. The contractor shall submit an affidavit certifying legal and proper dumping and disposal (including locations) of all materials from the project.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 27 00 DEFINITIONS & STANDARDS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 DELIVERY AND STORAGE

A. Materials shall be delivered dry, in their original, unopened containers, clearly labeled with manufacturer's name, brand name, and such identifying numbers as are appropriate. Materials shall be stored as required by the Manufacturer's specifications.

1. All materials shall be stored flat, or in the case of rolls, standing on end, elevated from the ground or deck, and protected with approved waterproof covers to keep the materials dry and protected from sunlight and moisture, and ventilated to prevent excessive temperature.

2. Flammable materials shall be stored in a cool, dry area away from sparks and open flames.

3. Damaged or deteriorated materials shall not be used and shall be removed from the job site.

4. All cardboard containers shall be stored in dry areas or on pallets. Packing materials shall be collected so as not to blow around the site.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

5. All materials shall be stored in temperatures specified by the manufacturer. Submit proposed storage arrangements regarding temperature to the Architect and the materials manufacturer for review.

6. All firestopping shall be performed by each respective trade. All File Sub-Bidders shall firestop their own work.

1.03 JOB CONDITIONS

A. Do not deliver to site or install any material or system that has not been approved. Materials installed without approval may be required to be removed and replaced at no additional cost to the owner.

B. Materials which have a temperature other than the application temperature of the manufacturer shall not be applied.

C. All materials shall be installed according to manufacturer's specifications and shall be compatible with the existing materials used on site.

D. Remove only as much existing roofing as can be replaced and made weathertight each day, including all flashing work.

E. All surfaces to receive the new materials shall be thoroughly dry. Should surface moisture such as dew exist, the Contractor shall provide the necessary equipment to dry the surface prior to application.

1.04 CONDITIONS, DIMENSIONS AND QUANTITIES

A. All conditions, dimensions and quantities shall be determined or verified by the Contractor. The Plans and details have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.05 DEFINITION OF "CONSULTANT"

A. Any reference to "Designer", "Engineer" or "Architect" in this Project Manual, Specification or on the drawings shall refer to CBI Consulting Inc., 250 Dorchester Avenue., Boston, Massachusetts 02127, (617) 268-8977, Michael Teller, Project Architect.

1.06 DEFINITION OF "OWNER"

A. Any reference to the Owner shall be Town of Barnstable, MA.

1.07 MINIMUM REQUIREMENTS

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

A. It is the intent of these contract documents to, in some cases, exceed the minimum requirements of the manufacturer. The new work shall be bid and installed as detailed.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 30 00 SUBMITTALS

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 1- GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be provided complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually provided in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated into the work shall be new and of the best grade of their respective kinds.

E. Consult the individual sections of the specifications for the specific submittals required under those sections and for further details and descriptions of the requirements.

1.02 GENERAL PROCEDURES FOR SUBMITTALS

A. Timeliness - The Contractor shall transmit each submittal to the Designer sufficiently in advance of performing related Work or other applicable activities so that the installation is not delayed by processing times, including disapproval and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect in advance of the Work.

B. Sequence - The Contractor shall transmit each submittal in a sequence which will not result in the Architect’s approval having to be later modified or rescinded by reason of subsequent submittals which should have been processed earlier or concurrently for coordination.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. The Contractor's Review - Only submittals received from and bearing the stamp of approval of the Contractor will be considered for review by the Architect. Submittals shall be accompanied by a transmittal notice stating name of Project, date of submittal, "To", "From" (Contractor, Subcontractor, Installer, Manufacturer, Supplier), Specification Section, or Drawing No. to which the submittal refers, purpose (first submittal, resubmittal), description, remarks, distribution record, and signature of transmitter.

D. Architect’s Action - The Architect will review the Contractor's submittals and return them with one of the following actions recorded thereon by appropriate markings:

1. Final Unrestricted Release: Where marked "Approved" the Work covered by the submittal may proceed provided it complies with the requirements of the Contract Documents.

2. Final-But-Restricted Release: When marked “Approved as Noted” the Work may proceed provided it complies with the Architect’s notations or corrections on the submittal and complies with the requirements of the Contract Documents. Acceptance of the Work will depend on these compliances.

3. Returned for Resubmittal: When marked "Revise and Resubmit" or "Disapproved" the Work covered by the submittal (such as purchasing, fabrication, delivery, or other activity) should not proceed. The submittal should be revised or a new submittal resubmitted without delay (no limit to number of resubmissions), in accordance with the Designer's notations stating the reasons for returning the submittal.

E. Processing - All costs for printing, preparing, packaging, submitting, resubmitting, and mailing, or delivering submittals required by this contract shall be included in the Contract Sum.

1.03 OR EQUALS

A. Definition - Whenever a specification section names one or more brands for a given item, and the Contractor wishes to submit, for consideration, another brand, the submission shall be considered an "or-equal" or a "material substitution". For the purposes of this Contract, the terms "or-equal" and "material substitution" shall be considered synonymous.

B. In no case may an item be provided on the Work other than the item named or described, unless the Architect, with the Owner’s written concurrence, shall consider the item equal to the item so named or described, as provided by M.G.L. c.30 § 39M.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. The equality of items offered as "equal" to items named or described shall be proved to the satisfaction of the Architect, including all research and full documentation, at the expense of the Contractor submitting the substitution.

D. The Designer and/or the Owner may require that full size samples of both the specified and proposed products be submitted for review and evaluation. The Contractor shall bear full cost for providing, delivering, and disposal of all such samples.

E. The Contractor shall assume full responsibility for the performance of any item submitted as an "Or-Equal" and assume the costs of any changes in any Work which may be caused by such substitution.

F. Or Equal Approval Process - On the transmittal, or on a separate sheet attached to the submission, the Contractor shall direct attention to any deviations, including minor limitations and variations, from the Contract Documents.

1. The Contractor shall submit to the Architect for consideration of any or-equal substitution a written point-by-point comparison containing the name and full particulars of the proposed product and the product named or described in the Contract Documents.

2. Such submittal shall in no event be made later than ten (10) calendar days prior to the incorporation of the item into the Work. In any case in which the time period specified in the Contract Documents from the Notice to Proceed to Substantial Completion is less than 30 days, this requirement can be waived by the Architect.

3. Upon receipt of a written request for approval of an or-equal substitution, the Architect shall investigate whether the proposed item shall be considered equal to the item named or described in the Contract Documents. Upon conclusion of the investigation, the Architect shall promptly advise the Contractor that the item is, or is not, considered acceptable as on Or-Equal substitution. Such written notice must have the concurrence of the Owner.

1.04 SUBMISSION OF SHOP DRAWINGS

A. Shop Drawings shall be complete, giving all information necessary or requested in the individual section of the specifications. They shall also show all adjoining Work, other work affected, and details of connection thereto, including hardware, flashing, waterproofing, and all utilities.

B. Shop Drawings shall be for whole systems. Partial submissions will not be accepted.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. The Architect reserves the right to review and approve shop drawings only after approval of related product data and samples.

D. Shop drawings shall be properly identified and contain the name of the project, name of the firm submitting the shop drawings, shop drawing number, date of shop drawings and revisions, Contractor's stamp of approval, and sufficient spaces near the title block for the Architect's stamp.

E. The Contractor shall submit to the Architect seven (7) black line prints of each shop drawing. Transparency and prints shall be mailed or delivered in roll form. Each submittal shall be accompanied by a transmittal notice.

F. When the transparency is returned by the Architect with the stamp "Revise and Resubmit" or "Disapproved", the Contractor shall correct the original drawing or prepare a new drawing and resubmit seven (7) prints thereof to the Architect for approval. This procedure shall be repeated until the Architect’s approval is obtained. No limit.

G. The Contractor shall maintain one full set of approved shop drawings at the site.

H. Photo copies of the bid documents are not acceptable as shop drawings.

I. Provide shop drawings for every item to be installed or repaired in the entire project, whether or not indicated in the spec section.

1.05 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES (SUBMITTALS AND DISTRIBUTION)

A. The General Contractor, within ten (10) working days after the commencement of work shall prepare and submit for the Architect’s approval a schedule of Shop Drawings, Product Data and Samples required to be submitted for the work. 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 the work, subject to Architect’s approval. The schedule of Shop Drawings shall correspond to the Construction Schedule so that the submissions relate to the time when the products and/or systems will be required on the site. The Architect will not approve a Schedule which calls for out of sequence submittals.

B. General Contractor shall submit Shop Drawing, product data and samples accompanied by the General Contractor’s Shop Drawing, Product Data and Sample Transmittals form.

C. Preparation of Submittal Form: Fill out transmittal form in the following manner using a typewriter or word processor, and retain one copy – General Contractor’s first file:

1. General Contr. General Contractor’s name and job number.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

	Job No.	
2.	Spec. Section	The Specification Section number where item is specified – do not submit items from more than one Specification Section on the same form.
3.	Submitted by	Name of General Contractor's employee responsible for the General Contractor's review.
4.	Project/No.	Project name and Architect's project number.
5.	Transmittal No.	Transmittal numbers shall be consecutive for the project.
6.	Date Submitted	Date leaving General Contractor's office.
7.	Subcontractor	Name of firm preparing original documents (shop drawings or sample).
8.	Submission No.	1st, 2nd, 3rd, etc. depending on previous submission for same item (see Resubmittal procedure).
9.	Spec. Sec. Para.	Specific paragraph number which item as Specified.
10.	Copies & Type	Number of copies submitted and type of material submitted (sepia, print, brochure or sample, etc.).
11.	Contr.'s Remarks	Note exceptions or deviations from the Contract Documents and reasons for them.

D. Resubmissions: Resubmittal shall follow the same procedures as the initial submittal with the following exceptions:

1. Transmittal shall contain the same information as the first transmittal except that transmittal numbers shall run consecutively and the submission number shall indicate 2nd, 3rd, etc. submission. The drawing number/description shall be identical to the initial submission and the date shall be the revised date for that submission.

2. Unless otherwise approved by the A, no new material shall be included on the same transmittal for a resubmission.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3. Where Resubmittal has not been required by the Architect, but corrections have been noted on a shop drawing, seven (7) prints of the drawings after the noted corrections have been made shall be submitted to the Architect for record purposes but not for action. Shop Drawings reviewed by the Designer's Architects will have three prints returned.

E. Submittal Procedures by General Contractor for Approval

1. General: All submittals shall be made to Architect's office.

2. Shop Drawings: Seven (7) black line prints (maximum sheet size shall be 30 x 42.

F. Architect's Review Procedures:

1. The Architect's review, including Architect's review period will not exceed fourteen (14) calendar days from the established date of each submission indicated on the Schedule of Shop Drawings, Product Data, and Samples plus the additional time, if any, for distribution by the General Contractor and receipt of submissions by the Architect. The General Contractor is required to strictly adhere to the established Schedule dates.

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

3. The Architect will fill out transmittal in the following sequence:

a.	Date Received	Date arriving in the Architect's office.
b.	Date Return	Date leaving the Architect's office to the General Contractor.
c.	To/Date	Name of architect to whom submission is sent for review and date leaving the Architect's office.
d.	From/Date	Name of architect reviewing submission and date arriving in the Architect's office.
e.	Action	Indicate action taken on submission.
f.	Distribution	Number of copies distributed and type of material distributed (sepia, print, brochure or samples, etc.).

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

g. Architect's Remarks — Note major deviations from the Contract Documents.

4. The Architect will return two (2) of Shop Drawings, one Sample or two brochures with copies of transmittal forms to the General Contractor.

5. The Architect will keep a copy and send one copy to the Owner.

1.06 SUBMISSION OF PRODUCT DATA

A. The Contractor shall submit seven (7) copies of Product Data to the Architect. All such data shall be specific and identification of material or equipment submitted shall be clearly marked in ink. Data of general nature will not be accepted.

B. Product Data shall be accompanied by a transmittal notice. The Contractor's stamp of approval shall appear on the printed information itself, in a location which will not impair legibility.

C. Product Data returned by the Designer as "Disapproved" shall be resubmitted in seven (7) days until the Architect's approval is obtained.

D. When the Product Data are acceptable, the Architect will stamp them "Approved" or "Approved as Corrected", distribute copies to the team 3 copies, and return two (2) copies to the Contractor. The Contractor shall provide and distribute additional copies as may be required to complete the Work.

E. The Contractor shall maintain one full set of approved, original, Product Data at the site.

F. Provide product data for all items to be installed whether or not noted in the specification section.

1.07 SUBMISSION OF SAMPLES

A. Unless otherwise specified in the individual section, the Contractor shall submit three specimens of each sample.

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

C. Samples of items of interior finishes shall be submitted all at once to permit a coordinated selection of colors and finishes.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

D. Samples which can be conveniently mailed shall be sent directly to the Designer, accompanied by a transmittal notice. All transmittals shall be stamped with the Contractor's approval stamp of the material submitted.

E. All other samples shall be delivered at the field office of the Project Representative with sample identification tag attached and properly filled in. Transmittal notice of samples so delivered with the Contractor's stamp of approval shall be mailed to the Architect.

F. If a sample is rejected by the Architect, a new sample shall be resubmitted in the manner specified hereinabove. This procedure shall be repeated until the sample is approved by the Architect.

G. Samples will not be returned unless return is requested at the time of submission. The right is reserved to require submission of samples whether or not particular mention is made in the specifications, at no additional cost to DCAM.

H Samples shall not be installed as part of the work.

I. Provide color and finish samples of every item to be installed.

1.08 CONSTRUCTION SCHEDULE

A. The Proposed Construction Schedule shall be based on an orderly progression of the work, allowing adequate time for each operation, and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Proposed Construction Schedule will be reviewed by the Owner/Architect for compliance with the requirements of this Article and will be accepted or returned to the Contractor for revision and resubmittal. Unless specifically required by law, no payment under this Contract shall be due until the Proposed Construction Schedule has been approved by the Owner/Architect.

B. The Proposed Construction Schedule in **critical path method form** which shall include the following with such other details as Owner/Architect may require:

1. Indicate complete sequence of construction by activity, with dates for beginning and completion of each element and stage of construction.

2. Identify each item by major Specification Section number.

3. Submittal and Approval Dates for all Shop Drawings and Samples.

4. A chart showing Critical Delivery Dates for Material and Equipment to be incorporated into the Work.

5. Provide sub-schedules to define critical portions of entire Schedule.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

6. Coordinate content with Schedule of Values and provide the cost of each activity as identified in the Construction Schedule.

C. During the progress of the Work, any changes in the original schedule desired by the General Contractor which affect Contract completion dates shall be approved by the Owner before being put into effect.

D. When changes in the Work are required, the original Proposed Construction Schedule shall be revised without delay to incorporate such changes or new work and indicate the effect hereof on the Project as a whole.

E. Provide updated critical path method (CPM) chart each month. Submit chart for review with Contractor's Application for Payment.

1.09 SCHEDULE OF VALUES

A. Prior to the first request for payment, the General Contractor shall submit to the Architect and Owner, a Schedule of Values of the various portions of the work in sufficient detail to reflect various major components of each trade, including quantities when requested, aggregating the total contract sum, and divided so as to facilitate payments for work under each Section in accordance with Article VII of the Contract Form. The Schedule shall be prepared in such form as specified or as the Architect or Owner may approve, and it shall include data to substantial its accuracy. Each item in the Schedule of Values shall include its proper share of overhead and profit in this schedule, including breakdown of values, requires the approval of the Architect and Owner and shall be used only as a basis for the Contractor's request for payment.

1.10 MANUFACTURER'S INSTRUCTIONS

A. Submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for all products.

1.11 CERTIFICATES OF COMPLIANCE

A. Submit certificates of compliance together with the associated Shop Drawings, Product Data and Samples required for the Product.

B. Submit on 8-1/2 in. x 11 in. white paper.

C. Submit one copy.

D. The Architect will retain the certificates of compliance; no approval reply is intended.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.12 PATTERNS AND COLORS

A. Submit accurate color charts and pattern charts to the Architect for his/her review and selection whenever a choice of color or pattern is available in a specified product, unless the exact color and pattern of a product are indicated in the Contract Documents. Submit actual cured samples of all materials for color approval.

1.13 RECORD DRAWINGS

A. At the completion of the project, the Contractor shall prepare a complete set of reproducible record drawings and AutoCAD Files, latest version on compact discs showing all systems as actually installed.

1.14 SUBMITTAL TRANSMITTAL FORM

A. All submittals shall be presented with the submittal transmittal form attached, completely filled out. Submittals without the attached form will be returned without review.

END OF SECTION

From:

(Contractor's Company Information)

SUBMITTAL TRANSMITTAL

Project: _____

To:

CBI Consulting Inc.
250 Dorchester Ave.
Boston, MA 02127

Contractor's Project #: _____

Architect's Project #: _____

C.C.: _____

Date: _____

Submittal Number: _____

We are sending for your ☐ Approval ☐ Review the following items:

Specification Number: 00 - 00 - 00.00 Specification Title: _____

Subcontractor/Supplier: _____

	Copies:	Date:	Description	Size:
Product Data Sheet				
MSDS Sheets				
Shop Drawings				
Warranties				
Qualifications				
Samples				

Deviations from Contract Documents: _____

_____

_____

Notes: _____

_____

_____

_____

Designer's Stamp

Contractor's Stamp

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 40 00 QUALITY CONTROL

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 PULL-OUT TESTS

A. The Contractor shall perform pull-out tests to determine the length and type of fastener required to provide adequate withdrawal resistance from every substrate.

B. A minimum of two pull out tests shall be performed per section to be fastened. More tests shall be performed if required by the structural engineer or the material manufacturer.

C. Submit a report from the fastener supplier and the product manufacturer describing the pull out tests, the recommend fasteners, and that they are covered under the warranty.

1.03 INSPECTION AND TESTING

A. An independent inspector and/or testing laboratory may be engaged and paid for by the Owner to perform the inspection and testing of the new work.

B. The Contractor shall cooperate with the inspector and/or testing laboratory, furnish materials and labor as may be required and provide for convenient access to all parts of the work for purposes of inspection and testing.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. The Contractor shall accept as final the results of all such inspection and testing.

D. The inspector shall have the authority to delay the commencement of work, or to stop the work at any time, for any reason which he deems necessary.

E. The inspector and/or testing laboratory reserves the right to require the Contractor to perform removal of materials installed by the Contractor. Make all cuts in accordance with the recognized standard practices. Remove materials only in the presence of the inspector.

1. Immediately after removing each material sample identify each by number and exact location by gummed label attached to a smooth surface of the cut sample.

2. Submit the cut samples directly to the inspector after applying identification.

3. Replace the cut with new materials, matching those removed, immediately after each removal, and insure that the replacement is completely watertight.

F. The removal cuts shall be subjected to various tests, including moisture content, density, thickness, compressive strength, composition, conformance with ASTM specifications where applicable, conformance with the recommendations of the manufacturers whose materials were used.

G. Bear all costs for tests where materials or systems have been found unacceptable and all costs for replacement required due to such unacceptability.

H. If any replacement work is required, such work will also be subject to the terms of this SPECIFICATION.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 50 00 TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 GENERAL

A. The Contractor shall be responsible for providing and maintaining all temporary facilities until Substantial Completion. Removal of such prior to Substantial Completion must be with the concurrence of the Architect. The Contractor bears full responsibility for reproviding any facility removed prior to Substantial Completion

B. Removal of all temporary facilities shall be a condition precedent to Substantial Completion unless directed otherwise by the Architect or specifically noted in the specifications.

C. The Contractor must comply with all safety laws and regulations of the Commonwealth of Massachusetts, the United States Government, and local government agencies applicable to Work under this contract. The Contractor's attention is directed to the Commonwealth of Massachusetts, Department of Labor and Industries Regulation 454 CMR.

D. Safety is the sole responsibility of the contractor on the job site. Contractor is notified that the building will be occupied during construction. The Architect does

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

not have control of the job site in any way.

A. The Owner will provide a space within the buildings for use by the Contractor as an office. .

B. Weekly job meetings shall be held at the job site.

1.04 TEMPORARY TELEPHONES

A. No telephone service will be provided by the Owner.

B. All telephone numbers shall be available to the project team. Provide pager for the project superintendent at the job site.

C. Provide 24-hour emergency phone numbers for the Contractor's Project Manager and Superintendent.

1.05 TEMPORARY CONSTRUCTION FENCE

A. The Contractor shall be responsible for providing and maintaining temporary fencing and barricades around the construction as may be necessary to assure the safety of all persons authorized or unauthorized. Such protective measures shall also be located and constructed as required by local, state, and federal ordinances, laws, codes, or regulations.

1.06 TEMPORARY STRUCTURES AND MATERIAL HANDLING

A. The Contractor shall provide such secure storage sheds, temporary buildings, or trailers as required for the performance of the Contract.

B. Materials shall be handled, stored, installed, cleaned, and protected in accordance with the best practice in the industry and, except where otherwise specified in the Contract Documents, in accordance with manufacturer's specifications and directions.

C. The Contractor must obtain the permission of the Owner for the placement of any storage facilities on site, and the Owner assumes no responsibility for articles stored.

1.07 TEMPORARY STAGING, LIFTS, STAIRS, CHUTES

A. Except as otherwise specified, the Contractor shall furnish, install, maintain in safe condition, and remove all scaffolds, staging, lifts, and planking over 8 ft. in height, required for the use of all trades for proper execution of the Work, except as noted.

B. The Contractor shall furnish, install, maintain in safe condition, and remove all temporary ramps, stairs, ladders, and similar items as required for the use of all

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

trades for the proper execution of the Work.

C. If the project is new construction permanent stairs shall be erected as soon as possible, for which the Contractor shall provide temporary protective treads, risers, handrails, and shaft protection.

D. The Contractor shall furnish, install, maintain, and remove covered chutes from the work area. Such shall be in convenient locations and permit disposal of rubbish directly into trucks or disposal units.

E. Debris shall not be allowed to fall freely from upper levels of the building. Materials shall not be thrown or dropped from open windows or the roof.

F. The General Bidder shall provide any and all additional protection required to keep the building from being damaged by the staging, hoisting, or any construction work. Protect parapets and roof edges with plywood at all swing staging. Protect landscaping from mechanical lifts. Cover and protect all roof surfaces with plywood as well.

1.08 HOISTING FACILITIES

A. Except as otherwise specified, the Contractor shall provide, operate, and remove material hoists, cranes, and other hoisting as required for the performance of the Work by all trades. All such hoisting service shall be without cost to the Subcontractors and Sub-Bidders.

1.09 UTILITIES

A. The contractor will be able to use without charge, electrical power and water. It is the responsibility of the Contractor to make provisions to extend the utility from the nearest service outlet designated by the Owner to the point of use. Any misuse will be cause for discontinuance of the utility whereupon the Contractor shall provide the service at his/her own expense. Electrical energy shall not be used for temporary heating purposes. Do not include any cost for use of electric power or water that may be supplied by the Owner in the Basic Construction Proposal. All work shall comply with all applicable codes as well as OSHA requirements.

1.10 TEMPORARY WATER

A. The Contractor may make use of the available water supply at the site for construction purposes, provided the permission of the Owner is obtained beforehand and only as long as the water is not used wastefully.

B. The Contractor shall provide all necessary piping and hoses to utilize the available sources of water.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. The Contractor shall provide an adequate supply of cool drinking water with individual drinking cups for personnel on the job.

1.11 TEMPORARY ELECTRICITY

A. The Contractor may make use of the electricity available at the site, metered and paid for by the Owner, provided that the Contractor shall supply proper adapters and extension cords.

1. Where heavy duty electric equipment drawing current in excess of 15 amperes is involved, the Contractor shall provide temporary service to supply the power.

2. The temporary electric service shall include, but not be limited to labor, materials, and equipment necessary to supply temporary power of adequate capacity for the project.

3. Transformers and meters, when required by the power company, will be furnished by the power company and the contractor shall pay the costs thereof.

B. Temporary electrical Work shall be performed under the direct supervision of at least one master electrician, who will be present on the project at all times when such work is being performed.

C. The Contractor shall furnish, install, and maintain lamps in operating condition. The Contractor, and each Subcontractor, shall furnish their own extension cords and additional lamps as may be required for their work. Temporary work of a special nature, not otherwise specified hereunder, shall be provided, maintained, and paid for the trade requiring same.

D. All lamps installed in permanent lighting fixtures and used as temporary lights during the construction period shall be removed and replaced shortly before Substantial Completion by the set of lamps required to be provided under the Electrical section of the specifications.

E. All temporary work shall be provided in conformity with the National Electric Code, State laws, and requirements of the power company. Particular attention is called to Commonwealth of Massachusetts, Department of Labor and Industries Regulation, 454 CMR.

1.12 WEATHER PROTECTION

A. The Contractor shall provide temporary enclosures and heat to permit work to be carried on during the months of November through March in compliance with MGL c.149 §44G (d). Without limitation this includes such items as excavation,

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

pile driving, steel erection, erection of certain exterior wall panels, masonry, sealants, waterproofing, sheet metal work, roofing, and similar operations.

B. "Weather Protection" means the temporary protection of that Work adversely affected by moisture, wind, and cold by covering, enclosing, and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the Owner and consistent with the construction schedule to permit the continuous progress of all Work necessary to maintain an orderly and efficient sequence of construction operations. The Contractor shall furnish and install "Weather Protection" material and be responsible for all costs, including heating required to maintain a minimum of 40 degrees F. at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials, or the applicable conditions set forth in the Contract Documents with added regard to performance obligations of the Contractor.

C. Within 30 calendar days after award of the Contract, the Contractor shall submit in writing, to the Architect for approval, three (3) copies of the proposed methods for "Weather Protection".

D. The Contractor shall assume the entire responsibility for weather protection during construction (until Substantial Completion), and shall be liable for any damage to any Work caused by failure to supply proper weather protection and proper ventilation.

E. Work damaged by frost shall be removed and replaced by and at the Contractor's expense and as directed by the Architect.

F. It is to be specifically understood that the Contractor shall do no work under any conditions deemed unsuitable by the Contractor to the execution of the Work. This provision shall not constitute any waiver, release, or lessening of the Contractor's obligation to bring the Work to Substantial Completion within the period of time set forth in the Contract Documents.

1.13 PROTECTION

A. Weather protection shall be provided for; weather conditions occurring or anticipated, the extent of the existing structure exposed, or any other possible hazard. Remove only as much roofing and sealant as can be completely replaced and made watertight in one day.

B. Dust control, pedestrian protection, and traffic control measures shall be provided during the course of the work.

C. Schedule and execute all work without exposing the sensitive building areas to the affects of inclement weather. Protect the existing structure and its contents against

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

all risks, and repair or replace all damage to the Owner's satisfaction. Protect all exterior building surfaces, roofing, lighting, landscape areas, and pavement from damage.

D. All new and temporary construction, including equipment and accessories, shall be secured from wind damage or blow-off.

E. The Contractor shall provide all necessary temporary protection and barriers to segregate the work area and to prevent damage to adjacent areas. Also provide plywood protection for roofing adjacent to construction. Areas damaged because of inadequate protection will be repaired at no additional cost to the owner, as per these specifications and the recommendations of the Architect.

F. Provide temporary barricades and other forms of protection as required to protect Owner's personnel, students, and general public from injury due to the work.

G. Any deteriorated substrate which is discovered shall be promptly reported to the Architect.

H. Safety on the job site is the sole responsibility of the contractor. The Contractor shall ensure that all Local, State, Federal, OSHA or other applicable safety requirements are strictly accorded to. All OSHA safety requirements regarding items such as scaffolding, temporary protections, lift trucks, cranes, removal of debris, dust control, cleaning solvents, and high pressure water washing, sandblasting and equipment shall be ensured by the Contractor.

1.14 DEBRIS

A. The Contractor will be responsible for the removal of all construction debris from the job site.

B. Upon completion of each day and each phase of the work the Contractor shall leave the premises free of all debris and waste, in broom-clean condition. Overnight storage of material on site will be as approved by the Owner. The Contractor shall be responsible for keeping the site free of rubbish and debris, and in a neat and orderly condition at all times. The Contractor shall clean up and remove all accumulated rubbish and debris daily.

C. The Owner's representative shall inspect the site daily. If it is determined that the site has not been cleaned of construction debris on a particular day the Contractor may be assessed $100.00 for that day to be used to have the site cleaned by in house personnel. This shall be prepared by the Architect as a deduct change order to the contract.

D. Debris resulting from the new work shall be placed in covered containers provided by the Contractor and legally disposed of. Burning will not be permitted on site.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

Dumpster locations shall be approved by the Owner.

1.15 TEMPORARY NOISE AND POLLUTION CONTROL

A. All work performed under the Contract shall conform to the requirements of Chapter 111, Sections 31C and 142D of the General Laws, Commonwealth of Massachusetts, Department of Public Health, and Metropolitan Boston Air Pollution Control District regulations.

1.16 CONSTRUCTION PARKING CONTROL

A. The Contractor shall control trucks and worker's vehicles to prevent unnecessary congestion in the neighborhood of the project. See Site Plan for allowable on site parking area.

B. The schedule and location of all deliveries of materials must be coordinated and approved by the Owner.

C. There is sufficient parking on site for the contractor’s vehicles. All parking will be at the direction of the Owner.

1.17 TEMPORARY SITE STORAGE

A. The Owner shall designate an area for temporary site storage on the site. All materials shall be stored in locked storage trailers or container boxes.

B. Storage of materials will not be permitted within any building in the scope of work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 51 00 PROTECTION

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 PROTECTION OF PERSONS & PROPERTIES

A. The site will not be occupied during construction. The contractor shall have complete control of the job site. The Contractor shall take all necessary precautions to ensure the public safety and convenience of visitors during construction. Safety is the sole responsibility of the contractor, regardless of what is set forth in this document. The architect does not have control of the job site, or means and methods, in any way.

B. Any damage to buildings, roads, (public and private), concrete walks, bituminous concrete areas, fences, rails, lawn areas, trees, shrubbery, poles, underground utilities, etc. shall be made good by and at the Contractor's own expense, all to the satisfaction of the Owner.

C. The Contractor shall patch, repair and/or replace all adjacent materials and surfaces damaged after the installation of new work to the complete satisfaction and at no expense to the Owner. All repair and replacement work shall match the existing in kind and appearance.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.03 TEMPORARY PROTECTION

A. The Contractor shall:

1. Protect excavations, trenches, buildings, and materials at all times from rain water, ground water, backing-up, or leakage of sewers, drains, or other piping, or from water damage of any origin. Provide all pumps, piping, coverings, and other materials and equipment as required by job conditions to accomplish this requirement.

2. In addition to the weather protection during the months of November to March specified elsewhere, provide temporary watertight enclosures for openings in exterior walls and in roof decks when and as required to protect the Work from damage by inclement weather. Temporary enclosures shall be provided with adequate means of ventilation to prevent accumulation of moisture in the buildings.

3. Provide temporary wood doors for exterior entrances and elsewhere when required. Permanent door enclosures shall not be used as temporary enclosures.

4. Protect sills, jambs, and heads of openings through which materials are handled.

5. Protect decks and slabs to receive work by other trades from any soiling which will prevent proper adhesion of subsequent Work. Decks and slabs shall be left clean and free of blemishes at the time other trades begin the application of their work.

6. Protect concrete slabs to remain exposed and finished floors against mechanical damage, plaster droppings, oil, grease, paint, or other material which will stain the floor finish. Install and maintain adequate strips of building paper or other protection on finished floors in rooms where future Work will be done by other trades.

7. Protect all surfaces to receive work by other trades from any soiling which will prevent proper execution of subsequent work

8. Protect other areas, furniture, and private property of the resident and the Owner. Any areas damaged by the Contractor shall be restored to the original condition or compensated at the Contractor's expense.

B. Roof surfaces and waterproofed surfaces shall not be subjected to traffic nor shall they be used for storage of materials. Where some activity must take place in order to carry out the Work, adequate protection must be provided.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. After the installation of the Work by any Subcontractor is completed, the Contractor shall be responsible for its protection and for repairing, replacing, or cleaning any such Work which has been damaged by other trades or by any other cause, so that all Work is in first class condition at the time of Substantial Completion.

1.04 ACCESS

A. The Contractor shall, at all times, leave an unobstructed way along walks and roadways, and shall maintain barriers and lights for the protection of all persons and property in all locations where materials are stored or work is in progress.

1.05 SECURITY

A. The Contractor shall be responsible for providing all security precautions necessary to protect the Contractor's and Owner's interests.

B. Where excavation is involved, the Contractor shall be responsible for providing continuous watchmen service as necessary, to insure adequate protection of the general public.

1.06 NOISE AND DUST CONTROL

A. The Contractor shall take special measures to protect the residents, neighbors, and general public from noise, dust, and other disturbances by:

1. Keeping common pedestrian and vehicular circulation areas clean and unobstructed;

2. Insulating work area from occupied portions as far as possible; and

3. Sealing dust and fumes from contaminating occupied spaces.

1.07 FIRE PROTECTION

A. The Contractor shall take necessary precautions to insure against fire during construction. The Contractor shall be responsible to insure that the area within contract limits is kept orderly and clean and that combustible rubbish and construction debris is promptly removed from the site.

B. Installation of equipment suitable for fire protection shall be done as soon as possible after commencement of the Work. The Contractor's attention is directed to the requirements of the Commonwealth of Massachusetts, Department of Labor and Workforce Development Regulation 454 CMR.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.08 WIND PROTECTION

A. Should high wind warnings be issued by the U.S. Weather Bureau, the Contractor shall take every precaution to minimize danger to persons, to the Work, and to the adjacent property.

1.09 WEATHER PROTECTION

A. The Contractor shall provide Weather Protection as required by Specification Section 01500 Temporary Facilities and any other specific requirements of the Contract Documents.

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 52 00 CLEANING UP

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

E. This section supplements the General Conditions.

F. Consult the individual sections of the specifications for cleaning of Work installed under those sections.

1.02 CLEANING DURING CONSTRUCTION

A. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on the site.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

3. Do not dispose of wastes into streams or waterways.

B. Wet down dry materials and rubbish to lay dust and prevent blowing dust.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. Do not allow materials and rubbish to drop free or be thrown from upper floors, but remove by use of a material hoist or rubbish chutes.

D. Maintain the Site free from accumulations of waste, debris, and rubbish.

E. Provide on-site containers for collection of waste materials and rubbish.

F. At the end of each day, remove and legally dispose waste materials and rubbish from site.

G. Disposal of materials shall be in compliance with all applicable laws, ordinances, codes, and by-laws.

1.03 FINAL CLEANING

A. Prior to submitting a request to the Architect to certify Substantial Completion of the Work, the Contractor shall inspect all interior and exterior spaces and verify that all waste materials, rubbish, tools, equipment, machinery, and surplus materials have been removed, and that all sight-exposed surfaces are clean. Leave the Project clean and ready for occupancy.

B. Unless otherwise specified under other sections of the Specifications, the Contractor shall perform final cleaning operations as herein specified prior to final inspection.

C. Cleaning shall include all surfaces, interior and exterior, which the Contractor has had access to, whether new or existing.

D. Employ experienced workmen or professional cleaners for final cleaning.

E. Use only cleaning materials recommended by the manufacturer of the surface to be cleaned.

F. Use cleaning materials which will not create a hazard to health or property and which will not damage surfaces.

G. All broken or defective glass caused by the Contractor's Work shall be replaced at the expense of the Contractor.

H. Remove grease, mastic, adhesive, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior surfaces. This includes cleaning of the Work of all finishing trades where needed, whether or not cleaning by such trades is included in their respective specifications.

I. Clean and polish all new and existing glass and plastic glazing (if any) throughout

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

the building(s), on both sides. Clean plastic glazing in accordance with the manufacturer's directions. This cleaning shall be completed by qualified window cleaners at the expense of the Contractor just prior to acceptance of the Work.

J. Wash and polish all mirrors.

K. Repair, patch, and touch up marred surfaces to the specified finish, to match adjacent surfaces.

L. Polish glossy surfaces to a clear shine.

M. Do the final cleaning of resilient floors and wood floors as specified under the respective sections of the Specifications.

N. Leave all architectural metals, hardware, and fixtures in undamaged, polished conditions.

O. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and decayable materials.

P. In cleaning items with manufacturer's finish or items previously finished by a Subcontractor, care shall be taken not to damage such manufacturer's or Subcontractor's finish. In cleaning glass and finish surfaces, care shall be taken not to use detergents or other cleaning agents which may stain adjoining finish surfaces. Any damage to finishes caused by cleaning operations shall be repaired at the Contractor's expense.

Q. Broom clean exposed concrete surfaces and paved surfaces. Rake clean other surfaces of grounds.

R. Ventilating systems - Replace filters and clean ducts, blowers, and coils if units were operated during construction.

S. Owner's responsibility for cleaning commences at Substantial Completion.

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 70 00 PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished be complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 COMPLETION OF WORK

A. The site shall be cleaned of all debris resulting from the work and areas damaged during the course of the work restored to the satisfaction of the architect and the Owner.

B. The Contractor shall notify the Architect and Owner that the work is completed and Project Manual requirements have been met. The Architect shall review the completed work with the Contractor within seven (7) calendar days of notification. Any deficiencies observed at the time will be conveyed directly to the Contractor with a written confirmation, after which the Contractor shall correct the stated deficiencies to the satisfaction of the Architect within fourteen (14) calendar days prior to demobilization from the site.

C. After satisfactory completion of the above, the work shall be considered complete with notification by the Architect to the Owner.

D. The Contractor shall submit all lien waivers and warranties at this time of final payment.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

E. All guarantees, as required in any Section of the Project Manual shall be submitted for approval prior to final payment.

F. Contractor shall maintain and record all changes to the plans throughout the entire project and shall submit as-built drawings of the entire project prior to final payment. As-built drawings must be in electronic form on Auto-CAD 2000 or later, submitted on CD. Electronic copies of the Architect's plans can be purchased from the Architect for a fee of $50 per sheet.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 72 00 SURVEYS AND RECORD DRAWINGS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.01 RECORD DRAWINGS

A. Record Drawings shall consist of all the Contract Drawings.

B. From the sets of drawings furnished by the Owner, the Contractor shall reserve one set for record purposes. From this set, the Contractor shall detach and furnish, at no charge to the Subcontractors the drawings of their portion of the Work for the same purpose.

C. The Contractor and the above Subcontractors shall keep their marked up As Built set on the site at all times and note on it in colored ink or pencil, neatly and accurately, at the end of each working day, the exact location of their work as actually installed. This shall include the location and dimensions of underground and concealed Work, and any architectural, mechanical, or electrical variations from the Contract Drawings. All changes, including those issued by Addendum, Change Order, or instructions by the Architect shall be recorded. Marked up As Built drawings shall be prepared for the entire project and include all Work, including but not limited to:

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) foot intervals and at all changes of direction.

2. The location of all internal utilities and appurtunces, concealed by finish materials, including but not limited to valves, coils, dampers, vents, cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps, and maintenance devices.

    a. The location of these, items shall be shown by offsets to structure and drawing grid lines.

    b. The tolerance for the actual location of these items on the marked up As Built Drawings shall be plus or minus two (2) inches.

    c. Each item shall be referenced by showing a tag number, areas served, and function on the marked up As Built drawing

D. The Architect may periodically inspect the marked up As Built drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of the monthly applications for payment.

E. At Substantial Completion the Contractor shall submit the complete set of marked up As Built drawings to the Architect. The Contractor shall check all marked up As-Builts prepared by subcontractors and certify in writing on the title sheet of the drawings that they are complete and correct, prior to submission to the Architect.

F. The Architect shall review the marked up As Built drawings and verify by letter to the Owner that the Work is complete. The Architect shall incorporate all changes onto original drawings.

G. The Contractor may make a written request for copies of the completed Record Drawings. The Contractor shall reimburse the Owner directly for the cost of printing of any requested Record Drawings.

H. Contractor shall maintain and record all changes to the plans throughout the entire project and shall submit as-built drawings of the entire project prior to final payment. As-built drawings must be in electronic form on Auto-CAD 2000 or later, submitted on CD. Electronic copies of the Architect's plans can be purchased from the Architect for a fee of $50 per sheet.

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 02 EXISTING CONDITIONS

SECTION 02 41 00 SELECTIVE DEMOLITION

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect Work of this Section whether or not such Work is specifically mentioned in this Section.

C. Coordinate Work with that of all other trades affecting or affected by Work of this Section. Cooperate with such trades to assure the steady progress of all Work under Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the Work shall be new and of the best grade of their respective kinds.

1.02 WORK TO BE PERFORMED

A. Provide all the Demolition Work required to complete the Work of the Contract including all the Demolition Work shown on the plans, listed in the specification, and needed to install a complete assembly in every way. Coordinate the Demolition Work with all the other trades for the project. Provide all demolition and disposal Work to complete the Demolition Work. Patch to match all adjacent surfaces that are disturbed, left exposed, or unfinished. All Work of the Contract is related. It is the General Contractor's responsibility to review all the Work of each section, each Subcontractor, and each file sub-bidder for the entire project so that all the Work can be properly and completely performed.

B. Selective Demolition Work includes, but is not limited to:

1. In general, the Contractor shall supply all material, equipment, temporary protection, tools and appliances necessary for the proper removal of selected construction materials for the completion of the Work as required in the Specifications, in accordance with good construction, and as required by the materials manufacturer.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2. Supply all shoring and protection necessary to protect the occupants, building area, building systems, and landscape areas. All means and methods are the responsibility of the Contractor. The Contractor is solely responsible for safety on the job site.

3. Extent of demolition as described on the drawings and in conjunction with all the new Work shown on the drawings. The General Contractor and each File Sub-Bidder is responsible for all demolition, disposal, and cleanup associated with their respective Work, whether or not shown on the plans or described herein required to complete the Work.

4. Remove and dispose of existing unit ventilators. Coordinate demolition with extent of new work. Refer to Section 23 00 00 - HVAC.

5. Refer to Section 01 13 00 – Alternates for description of Add Alternate Scope.

1.03 RELATED WORK

A. The following items of related Work are specified and included in other Sections of the Specifications:

1. Section 23 00 00, HVAC

1.04 QUALITY ASSURANCE

A. Supervision:

1. Engage and assign supervision of shoring and bracing Work to qualified personnel.

B. Regulations:

1. Comply with local codes and ordinances of governing authorities having jurisdiction.

1.05 SUBMITTALS

A. Schedule:

1. Submit schedule indicating proposed methods and sequence of operations for Selective Demolition.

2. Include coordination for shut-off, capping, and continuation of utility services in scope area.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.06 JOB CONDITIONS

A. Condition of Structures:

1. Owner assumes no responsibility for actual condition of items or structures to be demolished.

2. Conditions existing at time of commencement of Contract will be maintained by Owner insofar as practicable.

B. Protections:

1. Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition Work. Safety is the sole responsibility of the Contractor.

2. Provide protective measures to provide free and safe passage of Owner's personnel and general public to and from area of selective demolition.

3. Erect temporary covered passageways as required by authorities having jurisdiction.

4. Take measures to protect against windblown dust, obtain Owner's approval of means used for dust control.

5. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or Work to remain.

6. Protect from damage existing finish Work that is to remain in place and becomes exposed during demolition operations.

7. Protect adjacent materials and finishes with suitable coverings when necessary including, but not limited to, automobiles in parking lot adjacent to building which will remain in use during Work to be performed.

8. Remove protections at completion of Work.

C. Damages: Promptly repair damages caused to building or property, including cars, by demolition Work at no cost to Owner.

D. Traffic:

1. Conduct Selective Demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2. Do not close, block, or otherwise obstruct streets, walks, parking lot, or other occupied or used facilities without written permission from the authorities having jurisdiction.

3. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

E. Utility services:

1. Maintain existing utilities, keep in service, and protect against damage during demolition operations.

2. Do not interrupt existing utilities service occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide 48 hours notice if service must be interrupted.

3. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

F. Environmental Controls:

1. Comply with governing regulations pertaining to environmental protection.

2. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 INSPECTION

A. Before start of Selective Demolition Work, inspect areas in which Work will be performed.

3.02 PREPARATION

A. Structure Safety:

1. Provide exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structures to be demolished and adjacent facilities to remain.

2. Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3. Take precautions to support structure until determination is made for continuing operations.

B. Shoring and Bracing

1. If shoring and bracing is required, locate the system to clear permanent construction and to permit the completion of the Work.

2. Provide shoring and bracing system adequately anchored and braced to resist natural forces.

3. No shoring and bracing system shall remain at the completion of the Work.

3.03 DEMOLITION

A. General:

1. Perform Demolition Work in a systematic manner.

2. Use such methods as required to complete Work indicated on Drawings in accordance with Demolition Schedule and governing regulations.

3. If unanticipated mechanical, electrical, or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict with Consultant.

B. Disposal of Demolished Materials:

1. Remove debris, rubbish, and other materials resulting from demolition operations from site.

2. Transport and legally dispose of materials off site.

3. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution. Present receipts from certified waste disposal firms confirming hazardous waste disposal.

4. Burning of removed materials is not permitted on project site.

3.04 CLEANING AND REPAIR

A. On completion of demolition Work, remove tools, equipment, and demolished materials from site. Remove debris on a daily basis.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

B. Remove protection and leave areas broom clean.

C. Repair demolition performed in excess of that required.

D. Repair adjacent construction or surfaces soiled or damaged by selective demolition Work.

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

DIVISION 07 THERMAL AND MOISTURE PROTECTION

SECTION 07 84 00 FIRESTOPPING

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 as part of this Section.

B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under Contract.

D. It is the intent of the Specifications and the Drawings to require that the equipment to be furnished complete in every respect, and that this Contractor shall provide all equipment needed and usually furnished in connection with such systems to provide a complete installation. Equipment, materials, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

1.02 WORK TO BE PERFORMED

A. Provide all the Firestopping work required to complete the work of the contract including all the Firestopping work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all hardware, finishes, and accessories. Coordinate the Firestopping work with all the other trades for the project. Provide all demolition and disposal work to complete the Firestopping work. Patch to match all adjacent surfaces that are disturbed, left exposed, or unfinished. All work of the contract is related. It is the General Contractor's responsibility to review all the work of each section, each Subcontractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.

B. Firestopping work includes, but is not limited to:

1. Provide firestopping at all cored holes in masonry floors and walls.

2. Provide firestopping at all penetrations through floors, walls, and roof construction.

3. Provide Firestopping at all sealant joints in fire rated construction.

1.03 SYSTEM PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:

1. 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.

2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

a. Penetrations located outside wall cavities.

b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. Where firestop systems are to be installed in walls of shafts, stairwells and any other spaces that continue for more than one story, provide air-tight systems that will withstand positive and negative air pressures due to the stack effect and to motion of elevators.

1. Sealants installed in these locations shall not require heat-activation for air tightness.

2. Provide cold smoke seals as required.

1.04 INDOOR AIR QUALITY REQUIREMENTS

A. Volatile Organic Compounds: All products specified in this section shall comply with the following limits on content of VOC's:

1. Sealant: Maximum 250 grams/liter total VOC's.

B. No sealant specified in this section for interior installation shall contain aromatic solvents (organic solvent with a benzene ring in its molecular structure), fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium or hexavalent chromium.

1.05 SUBMITTALS

A. Product Literature: Submit 4 copies of product data sheets and the manufacturer’s installation instructions.

1.06 PRODUCT HANDLING

A. Delivery shall be in manufacturer’s original unopened container, clearly identifying each product specified, relating it to the product literature submitted.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FMG according to FMG 4991, "Approval of Firestop Contractors."

B. Installation Responsibility: For the work of the General Contractor, assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single qualified installer.

C. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

D. 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 by the UL in its "Fire Resistance Directory."

PART 2 - PRODUCTS

2.01 GENERAL

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. 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

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:
    a. Slag-/rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.
2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.02 MATERIALS

A. 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 following this Section that are produced by one of the following manufacturers:
    1. Hilti Construction Chemicals.
    2. RectorSeal Corporation (The).
    3. 3M, Fire Protection Products Division.

B. Basis of Design: Products below are designated in terms of names of products manufactured by Hilti Construction Chemicals, to establish the general character and materials required for firestop materials for this project. Equivalent products by acceptable manufacturers will be approved.

C. Install firestopping per manufacturer's specifications and requirements.

PART 3 – EXECUTION

3.01 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.
    1. Proceed with installation only after unsatisfactory conditions have been corrected.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3.02 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions.

3.03 FIRESTOP SYSTEM INSTALLATION

A. General: Install firestop systems to comply with specified Performance Requirements, and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

3.04 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.

3.05 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. Install firestop systems according to approved schedule of UL designs and products.

B. Where UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

C. Engineered Judgement: For situations where no UL-classified system has been established, provide firestop systems in compliance with Engineered Judgements.

END OF SECTION

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

SECTION 23 00 00

HVAC

PART 1 GENERAL

1.01 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. The HVAC Contractor shall act as the General Contractor and the terms HVAC or General Contractor shall be one of the same.

B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.

C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

D. It is the intent of the Specifications and the Drawings to require that all the material, labor, and equipment be furnished complete in every respect, and that this Contractor shall provide all material, labor, and equipment needed and usually furnished in connection with such systems to provide a complete installation including all demolition, disposal, and patching of adjacent surfaces. Materials, equipment, and articles incorporated in the work shall be new and of the best grade of their respective kinds.

E. The Bidder for the work shall list in the designated area of the GENERAL BID PRICING FORM, the name of each person, firm, or corporation, whom he proposes to use to perform the following classes of work or part thereof, at the bid price therefore:

CLASSES OF WORK	REFERENCE PARAGRAPH
Automatic Temperature Control	2.11, 3.10
Testing Adjusting and Balancing	3.11

1.02 SECTION INCLUDES

A. The work described herein shall be interpreted as work to be done by the HVAC contractor. Work to be performed by other trades will always be specifically referenced to that trade.

B. Furnish all staging, rigging, temporary supports, labor and materials to 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 new unit ventilators and installation of one indoor air handling unit with the following major sub systems:

1. Low Pressure, Steam & Condensate Piping, Insulation and accessories
2. Ductwork With Insulation
3. Terminal Heating Units including Unit Ventilators

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

4. Standalone Temperature Control System
5. Testing Adjusting and Balancing

D. Smoke and Firestopping Seals and sealing of all wall penetrations as detailed on the drawings.

E. Include the following work as needed to perform the work of this section.

1. Cutting, Core drilling and patching.
2. Temporary facilities, including but not limited to stairs and ladders, staging, scaffolding, chutes and hoisting.

1.03 RELATED SECTIONS

A. The following work is included in other sections. Coordinate the work of this section as required per those sections.

B. For power wiring of mechanical equipment refer to Electrical Drawings.

1.04 CODES, ORDINANCES, AND PERMITS

A. Perform all work in accordance with the requirements of Hyannis Building Department, State 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. Permits: Be responsible for filing documents, and securing of inspection and approvals. Pay all local connection and permit fees.

C. All HVAC equipment shall be installed to meet all State, Local and Federal sound ordinances.

1.05 QUALITY ASSURANCE

A. Codes and Standards:

1. ANSI Standards: Comply with ANSI A13.1 for pipe, valve, and equipment identification.
2. FM Compliance: Provide control devices and control sequences in accordance with requirements of Factory Mutual System (FM).
3. IRI Compliance: Provided control devices and control sequences in accordance with requirements of Industrial Risk Insurance (IRI).
4. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
5. 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.
6. 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".

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

7. 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.

8. 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. Automatic Temperature Control Contractor Qualifications: Branch Factory Owned Authorized dealers specializing in manufacturing and installation of control system for not less than 5 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.

1.06 HAZARDOUS MATERIALS

A. The HVAC Contractor shall be responsible for removing and legally disposing of any and all hazardous waste associated with HVAC new and existing systems, including but not limited to:

1. Un-used excess material such as adhesives used in ductwork and piping installations.

2. Items specifically noted on drawings.

1.07 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, or 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.08 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 ductwork and 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, Mechanical, Plumbing, Fire Protection 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.

1.09 ACCESSIBILITY

A. Install equipment and materials to provide required access for servicing and maintenance as well as code required clearances. 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.

1.10 ROUGH IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

1.11 PHASING

A. The mechanical contractor 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.

1.12 DEMOLITION

A. Where existing heating equipment (i.e. wall exhauster, unit ventilators etc.) are called to be removed, it shall include all associated piping, valves, wiring, controls, hangers, associated ductwork, and all associated appurtenances.

B. Where existing piping (i.e. steam, condensate return) and ductwork are called to be removed, it shall include all associated hangers, insulation, valves, controls, dampers and all associated appurtenances.

C. This contractor shall disconnect, lower to floor, and remove from the building and dispose of in a legal manner.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1.13 MECHANICAL INSTALLATIONS

A. Coordinate mechanical equipment and materials installation with other building components before installing.

B. Verify all dimensions by field measurements.

C. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work.

D. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

E. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

F. 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.

G. 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. Penetrations through construction as required for the work of this Section:

1. Coring: Perform all coring for required work.

2. Cut openings in new and existing non-masonry construction where required for penetrations.

B. Patching around penetrations through construction as required for the Work of this Section:

1. Patching of surfaces shall be performed by this HVAC contractor. Match adjacent surfaces and material.

1.15 SUBMITTALS

A. General: Refer to DIVISION 1, General Requirements for submittal of product data, shop drawings and other materials for review by the Architect and their Consultants. The following paragraphs supplement the requirements of that section.

B. Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by the General Contractor. Data submitted by Contractors and material suppliers directly to the Architect/Engineer will not be processed.

C. Submittal requirements specific to the Work of this Section include the following:

1. Valves

2. Hangers and Attachments

3. Mechanical Identification

4. Mechanical Insulation

5. Steam Piping

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

6. Terminal Heating Units (Unit Ventilators)
7. Metal Ductwork
8. Ductwork Accessories
9. Automatic Temperature Controls
10. Testing, Adjusting, and Balancing

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.

G. After the BAS system submittal is approved for construction, submit sample operator workstation graphics for typical systems for approval. Print and submit the graphics that the operator will use to view the systems, change set points, modify parameters and issue manual commands. Programming shall not commence until typical graphics are approved.

1.16 SUBSTITUTIONS

A. Refer to DIVISION 1, General Requirements for requirements in requesting substitutions. The following paragraphs supplement the requirements of that section.

B. If materials or equipment are substituted for basis of design 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 Architect/Engineer. Any and all substitutions are required to meet the specification and drawing requirements. Contractor shall be responsible for coordinating dimensional fit of equipment that varies from basis of design equipment. 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 from the basis of design equipment, 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 20 days of signing contract, this listing indicating all equipment and manufacturers, as a part of the submittal

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

requirement. If the product list is not submitted, it will be the responsibility of the contractor to submit one of the three 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 and seal open ended ducts and pipes to prevent dust and debris from entering them.

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. General: Refer to DIVISION 1, General Requirements for general requirements for maintaining as-built drawings and submitting final reproducible record documents. The following paragraphs supplement the above.

B. Provide Record Drawings for the Work of this Section and include the following: Provide electronic AutoCAD drawings and hard copy to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, balancing and control, dampers, isolation and control valves, and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, concealed equipment, 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. General: Refer to DIVISION 1, General Requirements for general requirements for submittal of operations and maintenance manuals, training of personnel and related

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

closeout procedures. The following paragraphs supplement the requirements of that section.

B. Closeout procedures specific to the Work of this Section include the following:

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 start-up reports for all major HVAC systems and equipment, including but not limited to, boilers, all air handling equipment, ductless cooling unit systems, pumps and fans.
6. Parts list for each piece of equipment including filter sizes and quantities for all equipment.

1.22 WARRANTIES

A. The contractor shall provide a one 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 requirements for additional warranty requirements.

1.23 HOISTING EQUIPMENT AND MACHINERY

A. Unless otherwise specified, all hoisting and rigging equipment and machinery required for the proper and expeditious prosecution and progress of the Work of this Section shall be furnished, installed, operated and maintained in safe condition by each contractor.

1.24 STAGING AND SCAFFOLDING

A. Unless otherwise specified, each contractor shall provide all lifts and man-lifts, and furnish, erect and maintain in safe condition, all staging and scaffolding as needed for proper execution of the work of this Section. Staging and scaffolding shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

1.25 WELDING QUALIFICATIONS

A. Piping shall be welded in accordance with qualifications procedures using performance qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME BPV IX. Welding procedures qualified by others, and welders and welding operations qualified by another employer may be accepted as permitted by ASME B31.1. The Owner’s Representative shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practicable. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record. Structural members shall be welded in accordance with Division 01.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

B. When open-flame or spark producing tools such as 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 fire watch/fire detail (by the Arlington Fire Department) where work is being performed and until it is completed. This Contractor shall be responsible for obtaining required permit and paying all permit fees and Firewatch detail expenses.

PART 2 PRODUCTS

2.01 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT

A. Pursuant to Massachusetts General Laws Chapter 141, a Massachusetts Licensed electrician shall install all low voltage wiring required by this section.

B. 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 and all motors associated with variable frequencies drives shall be inverted duty motor with Aegis bearing protection rings:

	HP	RPM	Efficiency
a.	1	1800	85.5 percent
b.	1.5	1800	86.5 percent
c.	2	1800	86.5 percent
d.	3	1800	89.5 percent
e.	5	1800	89.5 percent
f.	7.5	1800	91.0 percent
g.	10	1800	91.7 percent
h.	15	1800	93.0 percent
i.	20	1800	93.0 percent
j.	25	1800	93.6 percent
k.	30	1800	94.1 percent
l.	40	1800	94.1 percent
m.	50	1800	94.5 percent

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 degrees C. environment with maximum 50 degrees C temperature rise for continuous duty at full load (Class F Insulation). All ratings shall be for inverter duty applications.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

5. Starting Capability: Frequency of starts as indicated by automatic control system and not less than five 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.
15. Provide AEGIS magnetic bearing protection ring for all inverter rated motors that are controlled by variable speed drives. The bearing protection ring shall channel harmful shaft voltages to ground to protect bearing races from pitting.

C. 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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 percent or better and shall be installed on all motors one horsepower and larger, that have an uncorrected power factor of less than 85 percent 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 two horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than two horsepower, switches shall be the same as fusible type.

2.02 HANGERS & ATTACHMENTS

A. Horizontal-Piping Hangers and Supports:

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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. Tyco Grinnell
   f. Or Equal.

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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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. Tyco Grinnell

f. Or Equal.

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. Tyco Grinnell

f. Or Equal.

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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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. Tyco Grinnell

   f. Or Equal.

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. Tyco Grinnell

   e. Or Equal.

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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.

2.03 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 in. thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 degrees F (52 degrees C) or greater. Cut length to extend 2 in. beyond each end of plastic pipe marker.

4. Small Pipes: For external diameters less than 6 in. (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 in. wide; full circle at both ends of pipe marker, tape lapped 1-1/2 in.

B. Application: Provide pipe labels for the following piping system:

1. Steam supply piping

2. Condensate return piping.

C. Valve Tags:

1. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4 in. high letters and sequenced valve numbers 1/2 in. high, and with 5/32 in. hole for fastener.

a. Provide 1-1/2 in. diameter tags, except as otherwise indicated.

b. Provide size and shape as specified or scheduled for each piping system.

c. Fill tag engraving with black enamel.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

D. Valve Schedule Frames:

1. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

E. Plastic Equipment Markers:

1. General: Provide manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code:

a. Yellow: Heating equipment and components.

2. Nomenclature: Include the following, matching terminology on schedules as closely as possible:

a. Equipment label “ID” from schedules.

b. Design capacity from schedules.

3. Size: Provide approximate 2-1/2 in. x 6 in. markers for each piece of equipment.

4. Application: Provide equipment labels for the following equipment:

a. Unit ventilators

2.04 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, ATM C1136, ASTM E96/E96M, with vapor barrier for piping with temperatures below ambient.

4. Encase pipe fittings insulation with one-piece pre-molded 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:

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

1. Application: Hot HVAC Piping (to 250 Degrees F)
    a. Insulate the following hot low pressure HVAC piping systems (steam piping up to 15 psi)
        1) Low pressure steam and condensate piping.
    b. Insulate each piping system specified above with the following type and thickness of insulation:
        1) Fiberglass: 1-1/2 in. thick for pipe sizes up to and including 1 1/4 in, 2 in. thick for all 1 1/2 in. pipe and larger.

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-6): 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, ATM C1136, ASTM E96/E96M, 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: Heating and Ventilation System Ductwork:
    a. Insulate the following ductwork:
        1) Outdoor air intake ductwork between air entrance and unit ventilator inlet.
    b. Insulate each ductwork system specified above with the following type and thickness of insulation:
        1) All outside air ductwork shall be 2 in. rigid (R-8).

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2.05 STEAM AND CONDENSATE PIPING

A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure-ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selections as determined by Installer to comply with installation requirements. Provide materials and products complying with ASME B31.9 Code for Building Services Piping where applicable, base pressure ratings on steam and condensate piping maximum design pressure. Provide sizes and types matching piping and equipment connections; provide fittings and materials which match pipe materials used in steam and condensate piping systems. Where more than one type of materials or products are indicated, selection is installer's option. All piping shall be seamless or electric resistance welded as required for application.

B. General: Provide identification complying with Division 23 section " Mechanical Identification".

C. Provide pipes and pipe fittings for the service and pressure indicated and in accordance with the following listings:

1. High Pressure Steam Piping: (Above 15 psi)
   a. Pipe Size 2" and Smaller: Black steel pipe; Schedule 80; Cast-iron threaded fittings, Class 250. ASTM A-53 grade B.
   b. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 80; wrought-steel buttwelding fittings, welded joints. ASTM A-53 grade B.
2. High Pressure Condensate Piping: (Above 20 psi)
   a. Pipe Size 2" and Smaller: Black steel pipe; schedule 80; Cast-iron threaded fittings, Class 250. ASTM A-53 grade B.
   b. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 80; wrought-steel buttwelding fittings, welded joints. ASTM A-53 grade B.
3. Low-Pressure Steam Piping:
   a. Pipe Size 2" and Smaller: Black steel pipe; Schedule 40; Cast-iron threaded fittings, Class 125. ASTM A-53 grade B.
   b. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 40; wrought-steel buttwelding fittings, welded joints. ASTM A-53 grade B.
4. Low-Pressure Condensate Piping:
   a. Pipe Size 2" and Smaller: Black steel pipe; Schedule 80; Cast-iron threaded fittings, Class 125. ASTM A-53 grade B.
   b. Pipe Size 2-1/2" and Larger: Black steel pipe; Schedule 80; wrought-steel buttwelding fittings, welded joints. ASTM A-53 grade B.
5. Pipe sleeves: Provide schedule 40 black steel pipe sleeve large enough to accept pipe along with specified pipe insulation at each point where pipe penetrates a wall or floor Sleeve shall be large enough to allow for free movement of pipe however minimized to prevent leakage of smoke and fire during a fire emergency. For all piping exposed to view provide a chrome plated escutcheon that will surround insulation where applicable or pipe for a neat finished

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

appearance. Where piping is concealed above ceilings no escutcheons are required.

D. General: Provide piping specialties for the service and pressure indicated and in accordance with the following listings:

1. Pipe escutcheons.
2. Pipeline strainers.
3. Dielectric unions.
4. Drip pans.
5. Sleeves.
6. Sleeve seals

E. Vacuum Breakers: Provide swing check valves.

F. General: Provide hangers and supports complying with Division 23 section "Supports and Anchors", in accordance with the following listings:

1. Adjustable steel clevises, adjustable pipe saddle supports, single pipe rolls, and adjustable roller hangers, for horizontal-piping hangers and supports.
2. Two-bolt riser clamps, for vertical-piping clamps.
3. Steel turnbuckles, for hanger-rod attachment.
4. Concrete inserts, C-clamps, malleable beam clamps, and steel brackets, for building attachments.
5. Protection saddles for saddles and shields.

G. Special meters and gages required for steam and condensate piping systems include the following types:

1. Steam Flow Meters: Provide meters, including orifice flanges, and stainless steel orifice plate designed for indicated steam flow rate (lbs. per hour), pressure (psig), and piping size. (Refer to drawings for values.)
2. Meter: Electrically-operated remote-transmitting steam flow meter with recorder and totalizer of continuous watt-hour meter type for flush-mounting on panel. Include electrical accessories for indicated services.
3. Transmitter: Provide mercury shut-off, equalizer valves and condensate chamber with gate valves. Connect transmitter to condensate chamber with seamless copper tubing.
4. Panel: Provide floor-mounted steel panel for mounting meter and transmitter.
5. Charts: Provide 25 - 10" diameter evenly graduated, direct reading, 7-day charts, for range indicated above.
6. Manufacturer: Subject to compliance with requirements, provide steam meters of one of the following:
   a. Aeroquip Corp.
   b. BLE; Unit of General Signal.
   c. Flow-Dyne Engineering, Inc.; Fluid Meters Div.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

d. Honeywell Inc.; Process Control Div.

2.06 STEAM AND CONDENSATE SPECIALTIES

A. General: Provide factory-fabricated steam and condensate specialties recommended by manufacturer for use in service indicated. Provide steam and condensate specialties of types, capacities, and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Size traps with appropriate industry standard safety factor for service indicated. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's opinion, but more than one type cannot be used on project.

B. THERMOSTATIC TRAPS:

1. Provide thermostatic traps as indicated, with body constructed of cast brass, with integral ball joint union, and screw-in top. Provide thermostatic element of diaphragm or bellows type, with stainless steel valve cone. Provide renewable stainless steel valve seats. Design trap for discharging condensate, air, and other non-condensable gases without loss of steam within the following pressure ranges:

a. Low Pressure Traps: -25" Hg to 25 psi.

b. Medium Pressure Traps: -25" Hg to 65 psi.

c. High Pressure Traps: -25" Hg to 150 psi.

2. Size traps based on capacities at 1-1/2" psi differential in accordance with FCI 65-3.

3. Manufacturer; Subject to compliance with requirements, provide thermostatic traps of one of the following:

a. Spirax Sarco.

b. Armstrong Machine Works.

c. ITT Fluid Handling Div. (Hoffman, Bell & Gossett).

d. American Air Filter Co.

e. Dunham-Bush, Inc.

f. Trane (The) Co.

g. Barnes & Jones, Inc.

C. FLOAT AND THERMOSTATIC TRAPS:

1. General: Provide float and thermostatic traps as indicated, with body and cover constructed of cast-iron or semi-steel, designed so all internal parts are accessible without disturbing piping. Provide thermostatic element of diaphragm or bellows type with stainless steel valve cone. Provide stainless steel or seamless copper float, with positive snap-action valve mechanism, stainless steel valve with renewable seat. Design trap for discharging condensate, air, and other non-condensable gases without loss of steam within the following pressure ranges:

a. Low Pressure Traps: -25" Hg to 15 psi.

b. Medium Pressure Traps: -25" Hg to 20 psi.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

c. High Pressure Traps: -25" Hg to 175 psi.

2. Size traps based on capacities at 2 psi differential in accordance with FCI 65-3.

3. Manufacturer; Subject to compliance with requirements, provide float and thermostatic traps of one of the following:

a. Spirax Sarco.

b. ITT Fluid Handling Div. (Hoffman, Bell & Gosset).

c. Armstrong Machine Works.

d. American Air Filter Co.

e. Dunham-Bush, Inc.

f. Trane (The) Co.

g. Barnes & Jones, Inc.

D. INVERTED BUCKET TRAPS:

1. General: Provide inverted bucket traps as indicated, with body and cover constructed of cast-iron or semi-steel, pressure rated for 250 psi, designed so internal parts are accessible without disturbing piping. Construct bucket of brass or stainless steel, and lever mechanism of heat treated stainless steel, operating on knife edges for friction-free performance. Construct removable seats and plungers of heat treated stainless steel.

a. Strainer: Provide integral inlet strainer built into trap body.

b. Check Valve: Provide integral check valve installed in trap inlet.

c. Air Vent: Provide integral bi-metal auxiliary air vent in top of inverted bucket.

2. Size traps based on inlet pressure in accordance with FCI 65-3.

3. Manufacturer: Subject to compliance with requirements, provide inverted bucket traps of one of the following:

a. Spirax Sarco.

b. Hoffman Specialty ITT; Fluid Handling Div.

c. Armstrong Machine Works.

d. American Air Filter Co.

e. Dunham-Bush, Inc.

f. Trane (The) Co.

g. Barnes & Jones, Inc.

E. THERMODYNAMIC TRAPS:

1. General: Provide thermodynamic traps as indicated, with body and cover constructed of stainless steel, pressure rated for 600 psi, designed so internal parts are accessible without disturbing piping. Construct disk of heat treated stainless steel.

a. Strainer: Provide integral inlet strainer built into trap body.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

b. Blow Down Valve: Provide blow down valve fitted on strainer blow down connection.

c. Insulated Cap: Provide insulated cap sized to fit over trap cover.

2. Size traps based on inlet pressure in accordance with FCI 65-3.

3. Manufacturer: Subject to compliance with requirements, provide thermodynamic traps of one of the following:

a. Spirax Sarco.

b. Hoffman Div. ITT Fluid Works.

c. Armstrong Machine Works.

d. Trane (The) Co.

F. STEAM HAND VALVES:

1. General: Provide steam terminal inlet valves with cast-brass body pressure rated for 125 psi, and packless construction. Provide non-heat conducting wheel handle with dial and pointer. Provide union coupling on outlet. Select ends and pattern to suit piping system and spatial requirements.

a. Stem Extension: Provide extension of valve stem as required to locate valve handle on top of radiation enclosures, of length to suit enclosed height. Provide dial and pointer to fit on top of enclosure under handle.

2. Manufacturer: Subject to compliance with requirements, provide steam terminal inlet valve of one of the following:

a. Spirax Sarco.

b. Hoffman Div. ITT Fluid Works.

c. American Air Filter Co.

d. Armstrong Machine Works.

e. Dunham-Bush, Inc.

f. Trane (The) Co.

G. STEAM VENTS:

1. General: Provide steam vents where required and elsewhere as indicated, for venting of air and non-condensable gases from steam piping system.

a. Quick Vents: Cast-brass body and bottom, with thermostatic bellows, and removable vent port with vacuum check.

b. Float Vents: Cast-iron body, cast-brass bottom, seamless brass float, thermostatic bellows, removable stainless steel seat, monel metal plunger, and vacuum check disks.

2. Manufacturer: Subject to compliance with requirements, provide steam vents of one of the following:

a. Spirax Sarco.

b. Armstrong Machine Works.

c. Eaton Corp.; Controls Div.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

d. Hoffman Specialty ITT; Fluid Handling Div.

e. Trane (The) Co.

H. PRESSURE REDUCING VALVES:

1. General: Provide pressure reducing valves where indicated, of size, capacity, and pressure rating as scheduled. Provide pilot-actuated, diaphragm type. Construct valve body of cast semi-steel with hardened stainless steel trim. Provide replaceable valve head and seat. Provide main head stem guide fitted with flushing and pressure arresting device. Provide cover over pilot diaphragm for protection against dirt accumulation.

2. Manufacturer: Subject to compliance with requirements, provide pressure reducing valves of one of the following:

a. Spence Engineering Co., Inc.

b. Spirax Sarco.

c. Fisher Controls International, Inc.

d. Hoffman Specialty ITT; Fluid Handling Div.

e. Leslie Co.

I. STEAM SAFETY VALVES:

1. General: Provide steam safety valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.

a. Bronze Safety Valves: Construct housing of cast bronze, disc and nozzle of forged copper alloy, lap seats to optical flatness. Set valve to relieve at 10 psi above operating pressure.

b. Cast-Iron Safety Valves: Construct of cast-iron, with all bronze/brass trim, fully enclosed spring. Set valve to relieve at 10 psi above operating pressure.

c. Drip Pan Elbows: Provide drip pan elbows on steam safety valves required to discharge.

2. Manufacturers: Subject to compliance with requirements, provide steam safety valves of one of the following:

a. Spirax Sarco.

b. Kunkle Valve Co., Inc.

c. Lunkenheimer Co.

d. Watts Regulator Co.

2.07 TERMINAL HEATING UNITS (STEAM)

A. HYDRONIC UNIT VENTILATORS (UV)

1. General: Provide unit ventilators with valve control blow-thru design having cabinet sizes, and in locations indicated, with capacities, style, and having

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

accessories as scheduled. Include in basic unit cabinets, dampers, fanboard assembly, ECM motors, DDC controls and coils.

2. Cabinets: Construct of 14-ga furniture steel with exposed edges rounded. Provide removable front. Clean, phosphatize, and flow coat with baked primer paint on all steel surfaces. Finish with baked enamel, standard color as selected by Architect, provide sample selection chart. Provide 12-ga demountable fanboard assembly. Provide continuous heavy steel bars welded in place for discharge grilles, integral with unit structure. Provide completely removable panels for access to piping and valves. Provide leveling legs. Provide pipe access openings in bottom of each end pocket, and pipe chaser across back of unit for crossover piping and wiring.

3. Dampers: Provide insulated dual-blade mixing face and by-pass dampers for modulation of return and outside air. Provide sealing device on damper edges and end.

4. Fan Board Assembly: Provide assembly including fans, fan housings, bearings, and fan shaft. Mount fan assembly on rubber isolators.

5. ECM Motors: The motor must be driven by an electrically commutated electrical motor (ECM) with permanent magnet rotor. The rotor magnets shall by time stable, non-toxic ceramic magnets (SR-FE). The electrically commuted electrical motor shall be driven by a frequency converter with an integrated PFC filter. Each unit shall also be provided with an automatic transformer with multiple voltage leads to select the design CFM indicated in the schedules.

6. Steam Coils: Construct steam coils of 5/8" copper tubes with plate-type aluminum fins.

7. Accessories: Provide the following accessories as indicated and/or specified.

   a. Filters: Provide 1" thick MERV 8 throwaway filters

   b. Provide necessary false back with four inch end panels.

8. Controls: Include in factory assembled unit, chassis, coils, drain pan assembly, fans, housing, motor, filter, 24V auto-transformer with multiple voltage leads for fan speed control, outside and return air dampers, fan start/stop relay, insulation, DDC controller (microprocessor with scheduling capability) operating in standalone with manufactures wall mounted electronic thermostat and CO2 sensor, as well as economizer control.

9. Manufacturer: Subject to compliance with requirements, provide unit ventilators of one of the following:

   a. Daikin McQuay

   b. Trane (The) Co.

   c. Magic Aire

   d. or equal

2.08 METAL DUCTWORK

A. Ductwork Materials:

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.

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: Fibrous glass, complying with Thermal Insulation Manufacturers Association (TIMA) AHC-101; of thickness indicated on the drawings.
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.
    a. For exposed stainless steel ductwork, provide matching stainless steel support materials.
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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.

2.09 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 in. static pressure. Construct blades of 16-ga. aluminum; provide ½ in. diameter ball bearings, 1/2 in. diameter steel axles spaced on 9 in. centers. Construct from 2 in. x 1/2 in. x 1/8 in. steel channel for face areas 25 sq. ft. and under: 4 in. x 1-1/4 in. 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. Airguarde 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.

   h. Or Equal.

B. Turning Vanes:

1. Manufactured Turning Vanes: Provide double thickness airfoil turning vanes constructed of 1-1/2 in. wide curved blades set at ¾ in. o.c., supported with bars

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

perpendicular to blades set at 2 in. o.c, and set into side strips suitable for mounting in ductwork.

2. Manufacturer: Subject to compliance with requirements, provide turning banes 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. Southern, Inc.
   j. Or Equal.

C. 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. Quandrant 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 in.. 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.
   c. Ductmate Industries, Inc.
   d. Or Equal.

D. 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 in.x12 in. and to be gasketed and installed air tight. Provide one 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 insulted 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 in. high and smaller, 2 handle-type latches for larger doors.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.
   g. Or Equal.

E. 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.
   e. Or Equal.

2.10 FIRESTOP SYSTEMS

A. General: Provide firestopping at all new and existing construction where penetrated by the Work of this Section.

B. General

1. All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal, fire and smoke resistance properties of the barrier being penetrated. For applications where combustible penetrants are involved, i.e. insulated and plastic pipe, a suitable intumescent material must be used.
2. This section applies to pipe, duct, cable, and wiring penetrations of fire rated, smoke rated, non-rated bearing and non-bearing walls and floors assemblies.

C. References

1. American Society For Testing and Materials Standards (ASTM):
   a. ASTM E 814: Standard Test method For Fire Tests of Through-Penetration Firestops
   b. ASTM E84: Standard Test Method For Surface Burning Characteristics of Building Materials

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

2. Underwriters Laboratories Inc.:
   a. UL 1479 Fire Tests of Through-Penetration Firestops
   b. UL 723 Surface Burning Characteristics of Building Materials
3. UL Fire Resistance Directory:
   a. Through Penetration Firestop Device (XHJI)
   b. Fire Resistive Ratings (BXUV)
   c. Through Penetration Firestop Systems (XHEZ)
   d. Fill, Void, or Cavity Material (XHHW)

D. Definitions

1. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.
2. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), constitutes a "System".
3. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
4. Through-Penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
5. Membrane-Penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.
6. Construction Gaps: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications, edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, the firestopping system must comply with UL2079 for dynamic joints.

E. Quality Assurance

1. Firestopping systems (materials and design):
   a. Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
   b. The F rating must be a minimum of one, 10 hour but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s). the fire test shall be conducted with a minimum positive pressure differential of 0.01 in. of water column.
   c. For joints, must be tested to UL2079 with movement capabilities equal to those of the anticipated conditions.
2. Firestopping materials and systems must be capable of closing or filling through openings created by one) the burning or melting of combustible pipes, cable

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

jacketing, or pipe insulation materials, or two) deflection of sheet metal due to thermal expansion (electrical and mechanical duct work).

3. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.
4. Firestopping sealants must be flexible, allowing for normal pipe movement.
5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
6. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
7. All firestopping materials shall be manufactured by one manufacturer (to the maximum extent possible).
8. Installation of firestopping systems shall be performed by a contractor (or contractors) trained or approved by the firestop manufacturer.
9. Material used shall be in accordance with the manufacturer's written installation instructions.

F. Materials

1. Intumescent Firestop Sealants and Caulks:
   a. STI SpecSeal S100 and S500 Sealant
   b. 3M Fire Barrier Caulk CP25WB+
2. Latex Firestop Sealant:
   a. STI SpecSeal LC150 Sealant
3. Silicone Firestop Sealants and Caulks:
   a. STI SpecSeal Pensil 100 and 300
   b. 3M Fire Barrier Silicone Sealants
4. Firestop Putty:
   a. STI SpecSeal Firestop Putty Bars and Pads
   b. 3M Fire Barrier Moldable Putty
5. Firestop Collars:
   a. STI SpecSeal Firestop Collars
   b. 3M Fire Barrier PPD's
6. Wrap Strips:
   a. SpecSeal Wrap Strip
   b. 3M Fire Barrier FS195 Wrap Strip
7. 2-Part Silicone Firestop Foam:
   a. STI SpecSeal Pensil 200
   b. 3M Fire Barrier 2001 Silicone Foam
8. Firestop Mortar:
   a. STI SpecSeal Mortar

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

9. Composite Board:
   a. 3M Barrier Sheet Material
      1) Accessories:
      2) Forming/Damming Materials: Mineral Fiberboard or other type as per manufacturer recommendation.

2.11 AUTOMATIC TEMPERATURE CONTROLS

A. Basic Components and Systems:
   1. General: Provide control products in sizes and capacities indicated, consisting of 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 certified factory trained contractors with the following functional and construction features.

B. The following incidental work shall be furnished by the designated contractor under the supervision of the control contractor.
   1. The HVAC Contractor shall:
      a. Install automatic valves and separable wells that are specified to be supplied by the control contractor.
      b. Furnish and install all necessary valved pressure taps.
      c. Provide, on magnetic starters furnished, all necessary auxiliary contacts, with buttons and switches in the required configurations.
   2. Electric Wiring: All electric wiring and wiring connections, either line voltage or low voltage, from the emergency electric panels to the ATC panels, and from the ATC related panels to the individual control devices i.e. unit ventilators 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.
      a. 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, and fan rooms shall be installed in metal conduit
      b. All wiring above ceilings, in boiler rooms, and 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

C. 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 Drawings. All wiring shall comply with the requirements of applicable portions of the Electrical Section 26 00 01 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.

D. Line Voltage Power Sources

1. 120-volt AC circuits for the Controls Systems shall be taken by the Controls Contractor from electrical panelboards and circuit breakers.
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.

E. 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 in.
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 ft. in length when terminating to vibrating equipment.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

Flexible Metal Conduit may be used within partition walls and for final connection to equipment.

F. Penetrations
1. Firestopping for all penetrations used by dedicated Controls Systems conduits and raceways shall be by other trades.
2. All openings in fire proofed or fire stopped components shall be closed by other trades using approved fire resistive sealant.
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.

G. Control Valves: Provide factory fabricated electrical modulating control valves of type, body material and pressure class indicated. Where type or body material is not indicated, provide selection as determined by manufacturer for installation requirements and pressure class, based on maximum pressure and temperature rating of piping system. Except as otherwise indicated, provide valves which mate and match material of connecting piping. Equip control valves with control valve motors and with proper shutoff ratings for each individual application.
1. Steam Service Valves: Linear characteristics with rangeability of 30 to 1, and maximum full flow pressure drop of 80~ of inlet pressure for low pressure systems, and 42~ for high pressure systems.
2. Single Seated Valves: Cage type trim, providing seating and guiding surfaces for plug on "top and bottom" guided plugs.
3. Double Seated Valves: Balanced plug type, with cage type trim providing seating and guiding surfaces for plugs on "top and bottom" guided plugs.
4. Valve Trim and Stems: Polished stainless steel.
5. Packing: Spring loaded Teflon, self adjusting.
6. Terminal Unit Control Valves: Provide control valves for control of terminal units including, but not necessarily limited to fan coil units that are of integral motor type. Provide 2 port modulating type valves electrically actuated.

H. Field Devices
1. Provide instrumentation as required for monitoring, control or optimization functions.

2. Room Temperature Sensors

Temperature monitoring range	+20/120 deg. F -13 deg. to 49 deg. C)
Output signal	Changing resistance
Accuracy at Calibration point	+0.5 deg. F (+/- 0.3 deg. C)
Set Point and Display Range	55 deg. to 95 deg. F (13 deg. to 35 deg. C)
Outside air temperature:	
Temperature monitoring range	-58deg.+122deg.F(-50deg.Cto 50deg.C)
Output signal	4 – 20 mA DC
Accuracy at Calibration point	+0.5 deg. F (+/-0.3 deg. C)

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3. Control Valves (all control valves shall be modulating and have electric actuators with spring return, fail open)

Electric Control

Rangeability	40:1
Flow Characteristics	Modified. Equal percentage
Control Action	Normal open for steam with fail open spring return
Medium	Steam
Body Type	Screwed ends 2 in. and smaller, flanged
	Valves 2½ in. and larger
Body Material	Bronze
Body Trim	Bronze
Stem	Stainless Steel
Actuator	0-10 VDC, 4-20 MA
	24 VAC/120VAC – Modulating for all control valves.

a. All automatic temperature control valves in steam lines shall be provided with Characterized throttling plugs and shall be sized for minimum 25 percent of the system pressure drop or 3 psi, whichever is less.

I. Manufacturer: Subject to compliance with requirements, provide an Automatic Temperature Control System as manufactured by:
1. Johnson Controls
2. Honeywell
3. Vykon
4. Or approved equal

PART 3 EXECUTION

3.01 INSTALLATION OF HANGERS & ATTACHMENTS

A. 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.

B. 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.

C. 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,

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.

D. 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.

E. 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 in. provide heavy gage shield at each hanger point.
    c. Saddles: For all pipe sizes over 4 in. provide saddle at each hanger point. Completely fill void in saddle with loose insulation.

F. 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

G. Fabricate and install anchor by welding steel shapes, plates, and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

H. 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.

I. 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.

J. Concrete housekeeping bases shall be provided by the General Contractor for all floor-mounted equipment. Size bases to extend minimum of 4 in. beyond equipment base in any direction; and 4 in. above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

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.

3.02 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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 ft. along each piping run, except reduce spacing to 25 ft. 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 in. high lettering for name of unit where viewing distance is less than 2 ft. – 0 in., 1/2 in. high for distances up to 6 ft. – 0 in. and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

F. Ductwork Identification:

1. Install or apply labels per manufacturer’s recommendations.
2. Install in locations where it can be viewable by personnel.

G. 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.

3.03 INSTALLATION OF MECHANICAL INSULATION

A. Installation of Piping Insulation:

1. Insulation
2. Composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated. Do not cover calibrated balance valves until testing adjusting and balancing has been completed. mitted: Omit insulation on hot piping within radiation enclosures which serve the zone: steam piping passing through the zone must be insulated or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan. (Couplings in mechanical grooved systems will be insulated.)

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3. General: 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.
4. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance tests.
5. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
6. Clean and dry pipe surfaces prior to insulating. Butt installation joints firmly together to ensure a complete and tight fit over surfaces to be covered.
7. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.
8. Cover valves, fittings and similar items in each piping system with equivalent thickness and c
9. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
10. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3 in. wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3 in. wide vapor barrier tape or band.

B. 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. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its indented 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.

C. 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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 in. 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.

D. 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.

3.04 INSTALLATION OF STEAM AND CONDENSATE PIPING

A. INSTALLATION OF STEAM AND CONDENSATE PIPING:

1. Steam Piping:

a. Where possible, install piping with 1/16" per foot (1/2%) downward slope in direction of steam flow. Otherwise, install with 1/32" per foot (1/4%) downward slope.

b. Install branch-piping and rise-offsets with 1/8" per foot (1%) slope back to main.

c. Install branch-piping at top of main, either in vertical direction or at 45 degrees from vertical and perpendicular to main.

d. Install run-out piping to terminal units with 1/4" per foot (2%) slope back to main. Install with greater slope where expansion or contraction may cause condensate entrapment.

e. Install eccentric reducer where pipe is reduced in size, with bottoms of both pipe and reducer flush. Locate reducers 18" min. distance from branch connection.

f. Install high-pressure drip legs as required, and at 300' intervals of high-pressure steam piping mains.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

g. Install low-pressure drip legs as required, and at 100' intervals in low-pressure steam piping.

h. Install pipe sleeves at all wall and floor penetrations.

i. Install escutcheons at all exposed pipe wall penetrations.

2. Condensate Piping:

a. Install condensate piping to return steam condensate collection. Comply with applicable steam-piping installation requirements, except install piping with 1/32" per foot (1/4%) downward slope in direction of flow.

b. Install flash-legs as required to enable high pressure condensate to pass through flash-leg prior to entering gravity, low pressure condensate return. Discharge steam into relief vent line or low-pressure steam main.

B. INSTALLATION OF VALVES:

1. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more steam heating terminals or equipment connections, and elsewhere as indicated.

2. Drain Valves: Install on each mechanical equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain steam and condensate piping system.

C. FABRICATION AND INSTALLATION OF PIPING COMPONENTS:

1. General: Fabricate and install piping components in accordance with applicable requirements of Division 23 sections, ASME B31.9, and, where not otherwise indicated, comply with recognized industry practices to ensure that components serve intended function.

2. Bypass Piping: Except as otherwise indicated, fabricate and install bypass piping using same materials and in same plane as connected piping, but one pipe size smaller. Include valve in bypass piping.

3. Drip-Legs: Except as otherwise indicated, fabricate drip-legs from 2" pipe. Install to direct steam vertically downward; include Tee-fitting in vertical pipe; and install dirt-leg pipe at 180 deg. outlet of Tee-fitting. At 90 deg. outlet of Tee-Fitting connect valve, strainer, trap, and second valve. Provide trap with continuous flow capacity of 1.5 lbs./hr. of condensate per sq. ft. of surface of drained-pipe. Install bypass piping around strainer and trap. Install drip-legs at both ends of steam headers, at low points and at vertical offsets in piping runs where low points do not drain by natural flow, and elsewhere as indicated.

a. High-Pressure: Close dirt-leg pipe with blank flange.

b. Low-Pressure: Close dirt-leg pipe with cap or coupling and plug.

4. Flash-Legs: Fabricate flash-legs from oversize pipe; cap pipe ends and mount on pipe stand. Include safety valve.

D. EQUIPMENT CONNECTIONS:

1. General: Except as otherwise indicated, comply with the following where equipment connections are indicated.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

a. Install bypass valves one size smaller than piping to equipment.

b. Install check valves where check valves are indicated as vacuum breakers.

c. Where traps are indicated, install outlet piping of same size as trap.

d. Connect assemblies with nipples wherever possible.

e. Provide 3/4" strainer blow-off piping.

E. FIELD QUALITY CONTROL:

1. Piping Tests: Test steam and condensate piping in accordance with testing requirements of Division 23 Hydronic and Refrigerant piping.

F. ADJUSTING AND CLEANING:

1. Cleaning, Flushing and Inspection: Clean, flush, and inspect steam and condensate piping systems.

3.05 INSTALLATION OF STEAM AND CONDENSATE SPECIALTIES

A. General: Install steam and condensate specialties as indicated, and in accessible locations to permit service. When located behind heating enclosures, center steam and condensate specialties on access door. Install in neat and workmanlike manner. Use only wrenches having square flat jaws, or non-metallic strap wrenches on brass specialties, wrench marks will not be permitted.

1. Steam Vents: Install where required and elsewhere as indicated. Install shutoff valve between float vents and steam piping, pipe outlet to suitable plumbing drain, or as indicated.

3.06 INSTALLATION OF TERMINAL HEATING UNITS (STEAM)

A. INSTALLATION OF UNIT VENTILATORS:

1. General: Install unit ventilators as indicated, and in accordance with manufacturer's installation instructions.

2. Install piping as indicated

3. Protect units with protective covers during balance of construction.

4. Field Quality Control

a. Perform the following field tests and inspections and prepare test reports:

1) Leak Test: After installation, pressurize tubes and test for leaks. Repair leaks and retest until no leaks exist.

2) Operational Test: After electrical circuitry has been energized, start units to conform to proper unit operation.

3) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

b. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field assembled components and equipment installation, including connections, and to assist in field testing. Report any findings in writing.

c. Remove and replace malfunctioning units and retest as specified above.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

5. Cleaning and Protection

   a. Clean all visible surfaces of equipment; touch up as required.

   b. Protect all units before, during and after installation. Damaged materials due to improper protection shall be cause for rejection.

B. Adjusting and Cleaning:

1. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.

2. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

3. Install new filter units for terminal units, provide four sets of spare filters.

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. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

C. Provide one spare filter for each unit ventilator. Obtain receipt from Owner that stock of spare filters has been received.

3.07 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 (five percent leakage for systems rated 3 in. and under; one percent for systems rated over 3 in.) 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 in. 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".

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

B. Installation of Flexible Ducts:

1. Maximum Length: For any duct run using flexible ductwork, do not exceed 4 ft.-0 in. extended length.

2. Installation: Install in accordance with Section II of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".

C. 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.

D. Adjusting and Cleaning:

1. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

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.

3.08 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 volume and/or 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

3.09 INSTALLATION OF FIRESTOP SYSTEMS

A. General: Install firestop systems at all new and existing fire-rated construction where penetrated by the Work of this Section.

3.10 AUTOMATIC TEMPERATURE CONTROLS

A. Installation Of Automatic Temperature Controls:
   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 in. high temperature 105 degrees F. (41 degrees C) plastic insulation on each conductor and plastic sheath over all.
         3) Install electronic circuits with color-coded No. 22 wire with 0.023 in. 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.
   2. Adjusting and Cleaning:
      a. Start-Up: Start-up, test, and adjust 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 8 hours of onsite instruction on running and basic troubleshooting of 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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

c) Demonstrate scan, update, and alarm responsiveness.

c. Training:

1) All training shall be by the automatic temperature control sub-subcontractor and shall utilize specified manuals and as-built documentation.

2) Operator training shall include:

a) Sequence of Operation review.

b) Modifying warning limits, alarm limits and start-stop times.

c) System initialization.

d) Troubleshooting

3) Training shall be for Owner-designated personnel at the subject site, and shall be scheduled by the Owner with two week notice.

3.11 TESTING, ADJUSTING, AND BALANCING

A. REQUIREMENTS:

1. Requirements include verification of new HVAC system operation, measurement of all new system capacity, and establishment of the quantities of the new mechanical systems as required to meet specifications, and recording and reporting the results.

2. 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.

3. Do not include:

a. Installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing. Contact Mechanical Contractor and the Engineer for direction.

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. 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

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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.

c. ANSI/ASHRAE 110: Method of Testing Performance of Laboratory Fume Hoods

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.

5. Test all fume hoods in accordance with ANSI/ASHRAE 110 Standards. Balancer shall record and report all data and adjust fan sheaves, dampers etc. as required to achieve desired velocities and air flows.

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.

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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. 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 percent. 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:

CBI Consulting Inc.
Boston, Massachusetts
Tel: (617) 268-8977
Fax: (617) 464-2971

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, or lack of access.

b. Upon completion of system deficiencies, Balancing Contractor shall balance and record data again at no additional costs to the project/owner.

c. Any re-balancing required to meet the desired CFM or modified CFM due to system modifications or owner changes shall be provided at no additional costs to the project/owner.

d. The Balancing Contractor shall provide the necessary sheave and belt changes to motors and fans as required to achieve the desired CFM at no additional costs to the project/owner.

END OF SECTION