

POLICE LOCKER ROOM RENOVATION

INVITATION FOR BIDS



CITY OF LOWELL, MASSACHUSETTS

DELIVER TO:

**City of Lowell
Purchasing Department
375 Merrimack Street, Room 60
Lowell, MA 01852**

**LOWELL POLICE LOCKER
 ROOMS RENOVATIONS**

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LOWELL POLICE LOCKER ROOMS RENOVATION
CITY OF LOWELL
LOWELL, MASSACHUSETTS
CBI JOB NO. CB190850

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

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TECHNICAL SPECIFICATIONS

SECTION 00 85 10

DRAWING LIST

GENERAL

G0-01 COVER SHEET

ARCHITECTURAL

D1-01 DEMOLITION PLAN PATROLMAN

D1-02 DEMOLITION PLAN SUPERIOR OFFICER

A1-01 PROPOSED PLAN PATROLMAN

A1-02 PROPOSED PLAN SUPERIOR OFFICER

A1-03 REFLECTED CEILING PLAN PATROLMAN

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A3-01 ROOM FINISH AND DOOR SCHEDULES

A3-02 EXTERIOR CLERESTORY WINDOW SECURITY SCREEN

PLUMBING

P0-01 PLUMBING LEGEND, NOTE, SYMBOLS LIST, AND SCHEDULES

P0-02 PLUMBING DETAILS AND RISER DIAGRAMS

P1-01 PLUMBING DEMOLITION PLANS

P2-01 PLUMBING NEW WORK PLANS

MECHANICAL

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H0-02 HVAC DETAILS AND SEQUENCES

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ED-02 ELECTRICAL DEMOLITION FLOOR PLAN

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END OF SECTION

DRAWING LIST

00 85 10 - 1

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 01 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. Renovation of the existing supervisor locker room and bathroom, and the patrol locker room and bathroom for the Lowell Police Headquarters according to accessibility code requirements and also to accommodate an increased number of lockers.
 - 2. Removal of the existing metal lockers including the concrete curb.
 - 3. The purchase and installation of new lockers is outside of the scope of this project.

SUMMARY OF WORK

4. Provide new interior finishes including floor, walls, and ceiling.
5. Provide plumbing system including replacing all fixtures.
6. Provide new electrical power distribution, lighting, and fire alarm devices.
7. Retrofit new mechanical exhaust system into existing.
8. Coordinate all phasing of the work and require shutdowns with the owner, local electrical utility, and Architect to minimize impact in the police headquarters.

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.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 02 00

UNIT PRICES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The Unit Prices for items set forth in the Schedule of Unit Prices shall be used to determine adjustments to the Contract Sum when changes in the Work involving said items are made in accordance with sections of the Contract Documents.
- B. Unit Prices listed under ADDITIONS have been computed to include net cost plus overhead, profit, and bond and all other charges required to complete the work item.
- C. Unit Prices net cost includes the cost of all labor, materials, equipment, disposal, and all other costs required to complete the work item.
- D. Materials, methods of installation, and definitions of terms set forth under the various Unit Price items in the Schedule of Unit Prices shall be as indicated in the Contract Documents.
- E. Unit costs will not be adjusted if the quantities approved in the field by the Architect vary from the base contract quantities listed in the Project Manual.

1.02. APPLICABILITY OF UNIT PRICES

- A. The payment lines shall be determined in the field by the Architect.
- B. Unit Prices are for more work or less work than is included in the base contract for the various tasks included. Quantities to be included in the base contract are listed in the Unit Price Schedule.
- C. Prior to commencing removal or placement of materials set forth in the Schedule of Unit Prices, the Contractor shall notify the Architect in sufficient time to permit proper measurements to be taken on behalf of the Owner. Only quantities which have been approved in writing by the Architect will be considered in the determination of adjustments to the Contract Sum. Unit costs shall include the pro rata share of all costs associated with doing the work, including staging, insurance, overhead, and profit, as well.

- D. Performance of Work which is not required under the Contract Documents or which is not authorized by Change Order, whether or not such Work item is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment. The Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Architect.
- a. See attached Unit Price Schedule.

UNIT PRICE SCHEDULE

#	DESCRIPTION OF WORK	UNIT	BASE BID QUANTITY	REFERENCE DETAILS	ADD / DEDUCT UNIT PRICE (Insert only one number)
1	Remove Portions of Existing CMU Walls to Accommodate Plumbing Work	SF	150**	D1-01, D1-02 and P1-01, P1-02	

** - Indicates unit price scope indicated on the plans.

- E. All repair locations will be determined and marked in the field by the Architect. Repairs will be located at small individual locations throughout the entire scope area. Unit Price work performed without the approval of the Architect will not be paid for.
- F. The Owner reserves that right to increase or decrease the unit cost quantities without any adjustment in the unit costs.
- G. Unit costs include pro-rata share of Contractor's, general conditions, staging, insurance, bond, overhead, and profit, etc.

END OF SECTION

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 31 13

COORDINATION

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01000 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 CITY OF LOWELL POLICE AND PROCEDURES

- A. The safety and welfare of the Police Staff 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 the Police headquarters schedules, procedures, and activities.
- B. The General Bidder take note of Section 01 33 00.1.05.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.

- C. All construction activities and deliveries to the police headquarters are to be coordinated with the police representative and City Project Manager. The police headquarters will be occupied during construction.
- D. Pre-construction meetings shall be held with the police representative and the City Project Manager, 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 police headquarters. All material storage, locations of lifts, dumpsters, workers access, etc. will be only in areas approved by the City Project Manager.
- 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 police Representative. 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 City Project Manager daily at a time to be determined to inform them of the daily progress and review the schedule for the next three (3) days.

1.03 SCHEDULING

- A. Time is of the essence in this project.
- B. 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.

- C. 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.
- D. Work may commence at 7:00 A.M and continue until 5:00 P.M., Monday through Friday. The Contractor must request approval from the Police representative and the City Project Manager to work after hours, overnight, or on at no additional expense to the owner.

1.04 SUBCONTRACTORS

- A. Subcontractors are subject to approval by the Owner.

1.05 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.

1.06 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.

1.07 COORDINATION OF WORK

- A. Contractor shall coordinate all construction work with the City Project Manager

- 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 City of Lowell.

1.08 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.

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

1.10 CUTTING AND PATCHING

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

1.11 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.

1.12 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

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 33 00

SUBMITTALS

PART 1 – GENERAL

1.01 GENERAL PROVISIONS

- A. Include all Contract Conditions, Supplementary 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 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.

- 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.

- 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.

- 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 shop drawings via electronic means: email, Dropbox, etc. Each submittal shall be accompanied by a transmittal notice. In specific instances, the Architect may request hardcopy of shop drawings: in such cases, the Contractor shall submit two (2) sets of prints via mail or delivery, in roll form, at no additional cost to the Owner.
- F. When the shop drawings are 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 by the means described in paragraph 1.04 E above for approval. This procedure shall be repeated until the Architect's approval is obtained. No limit.
- G. The Contractor shall maintain one (1) full set of approved shop drawings at the site.
- H. Photocopies 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. Job No. General Contractor’s name and job number.
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 Architect, no new material shall be included on the same transmittal for a resubmission.
3. Where Resubmittal has not been required by the Architect, but corrections have been noted on a shop drawing, the drawings after the noted corrections have been made shall be submitted to the Architect by the means noted in paragraph 1.04 E above, for record purposes but not for action.

E. Submittal Procedures by General Contractor for Approval

1. General: All submittals shall be made to Architect's office.
2. Shop Drawings: submit in PDF format electronically, except as requested otherwise.

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.). |
| g. | Architect's Remarks | Note major deviations from the Contract Documents. |
4. The Architect will return Shop Drawings and brochures electronically with copies of transmittal forms to the General Contractor. Comments on samples will be returned electronically with photos of said samples; samples will not be returned unless agreed upon by Architect and Contractor.
5. The Architect will keep a copy and send one (1) copy to the Owner.

1.06 SUBMISSION OF PRODUCT DATA

- A. The Contractor shall submit Product Data to the Architect via electronic means: email, Dropbox, etc. 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, and return to the Contractor electronically. The Contractor shall provide and distribute additional copies as may be required to complete the Work.
- E. The Contractor shall maintain one (1) 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.
- 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 the Owner.
- 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.
 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" x 11" white paper.
- C. Submit one (1) copy.

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

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.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

ADD SUBMITTAL SHEET

SUBMITTAL TRANSMITTAL

From:

(Contractor's Company Information)

To: CBI Consulting, LLC
250 Dorchester Ave.
Boston, MA 02127

Project: _____

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: _____

Designer's Stamp

Contractor's Stamp

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 35 13

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 CONTRACTOR USE OF THE BUILDING, 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

SPECIAL PROJECT PROCEDURES

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.
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.

1.04 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 building 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. Roof and Finished Surfaces Protection:
 1. The Contractor shall restrict traffic on finished surfaces to that required to perform the work of this Contract and permit traffic only required to properly complete the Work.
 2. Effectively protect surfaces to prevent damages to existing substrates, new finishes. Provide temporary walkways and work platforms as needed.
- 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.

SPECIAL PROJECT PROCEDURES

1.05 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.

1.06 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.

1.07 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 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.

1.08 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.

1.09 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: other work subject to damage shall be protected against freezing or ice formations.

- B. Refer to SECTION 01 50 00 --TEMPORARY FACILITIES, for additional requirements applicable to winter construction.

1.10 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 metals, hardware, fixtures, and equipment shall be left in undamaged, bright, polished condition.
 - 4. 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.
 - 5. 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. Any damage to finishes caused by cleaning operations shall be corrected and repaired by the Contractor at no increase in Contract Price.

1.11 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.

1.12 PERMITS AND POLICE DETAILS

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

1.13 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.

1.14 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.
- 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 – Ninth Edition.
- J. The plans were compiled from various sources. The contractor is responsible for verifying all existing conditions and dimensions.

1.15 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.

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. City of Lowell and CBI Consulting LLC. 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

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 40 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 related to the interior work 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. The Contractor is responsible for the security and stability of partially completed work until the project is accepted by the Owner.

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

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 42 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.

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 LLC., 250 Dorchester Avenue., Boston, Massachusetts 02127, (617) 268-8977, Rick Almeida, Project Architect.

1.06 DEFINITION OF "OWNER"

- A. Any reference to the Owner shall be City of Lowell as represented by Michael Vaughn, Chief Procurement Officer.

DEFINITIONS & STANDARDS

LOWELL POLICE LOCKER ROOMS RENOVATION
CITY OF LOWELL
LOWELL, MASSACHUSETTS
CBI JOB NO. CB190850

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

1.07 MINIMUM REQUIREMENTS

- 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

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 45 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.

- 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 ensure 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

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 re-providing 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

TEMPORARY FACILITIES

not have control of the job site in any way.

1.03 FIELD OFFICES

- A. The owner will provide designated space within the building for use by the Contractor as an office space. However, Contractor shall provide the following:
1. One desk and four chairs.
 2. One coat rack and twelve (12) coat hooks.
 3. One plan rack and shelves for samples.
 4. One four-drawer metal file cabinet with lock and key.
 5. One IBM computer workstation with internet access.
 6. One accurate outside mercury thermometer.
 7. One conference table, 4'x10', with benches on both sides.
 8. One telephone available for use by the clerk of the Architect with calling service available to 617, 508, 781, and 978 area codes.
 9. Fax machine on separate phone line.
 10. Internet Access other than Dial Up.
 11. Bottled water and dispenser cups.
- B. The office, equipment, and furnishing shall be maintained by the Contractor in a clean and orderly condition and shall be removed upon receipt of written direction of the Official.
- C. The office shall be in a location provided by the Owner and shall be maintained by the Contractor in a clean and orderly condition.
- D. The Owner will provide any space within the buildings for use by the Contractor as an office. There is limited space on the property for contractor supplied storage units. Locations as directed by the Owner.
- E. Weekly job meetings shall be held at the job site in the field office.

1.04 TEMPORARY TELEPHONES

- A. The Contractor shall provide a telephone separate service for the use of the Contractor's authorized personnel, Subcontractors, as well as the Architect and the Owner in the Field Office.

TEMPORARY FACILITIES

- B. The Contractor shall pay for the installation and removal of the foregoing temporary telephones and for all calls and charges in connection therewith.
- C. No telephone service will be provided by the Owner.
- D. All telephone numbers shall be available to the project team. Provide telephone number for the project superintendent at the job site.
- E. Provide 24-hour emergency phone numbers for the Contractor's Project Manager and Superintendent.

1.05 TEMPORARY TOILETS

- A. Portable, temporary toilets shall be provided by the contractor and shall be located as directed by the owner.
- B. The Contractor:
 - 1. Assumes full responsibility for the use of the temporary toilets
 - 2. Pays all costs for operation, maintenance and cleaning.
- C. Under no circumstances will the Contractor's personnel be allowed to use the toilets and sinks in the building.
- D. The Contractor shall not have use of sanitary toilet facilities within the building and must provide portable sanitary toilets for the use of their forces for the entire duration of the work. Toilets shall be cleaned and emptied twice weekly (minimum) and as directed by the Owner.

1.06 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.

1.07 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.

TEMPORARY FACILITIES

- 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.

1.08 TEMPORARY STAGING, STAIRS, CHUTES

- A. Except as otherwise specified, the Contractor shall furnish, install, maintain in safe condition, and remove all scaffolds, staging, 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 trades for the proper execution of the Work.
- C. 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.
- D. 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 landscaping from mechanical lifts.

1.09 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.

1.10 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.

1.11 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.

TEMPORARY FACILITIES

- B. The Contractor shall provide all necessary piping and hoses to utilize the available sources of water.
- C. The Contractor shall provide an adequate supply of cool drinking water with individual drinking cups for personnel on the job.

1.12 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.

1.13 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, 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.

1.14 PROTECTION

- A. Dust control, pedestrian protection, and traffic control measures shall be provided during the course of the work.
- B. Schedule and execute all work without exposing the sensitive building areas to the effects of inclement weather. Protect the existing structure and its contents against all risks, and repair or replace all damage to the Owner's satisfaction. Protect all exterior building surfaces, lighting, landscape areas, and pavement from damage.

TEMPORARY FACILITIES

- C. All new and temporary construction, including equipment and accessories, shall be secured from wind damage or blow-off.
- D. 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.
- E. 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.
- F. Any deteriorated substrate which is discovered shall be promptly reported to the Architect.
- G. 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.

1.15 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. Dumpster locations shall be approved by the Owner.

1.16 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.

1.17 CONSTRUCTION PARKING CONTROL

- A. The Contractor shall control trucks and worker's vehicles to prevent unnecessary congestion in the neighborhood of the project.
- B. The schedule and location of all deliveries of materials must be coordinated and approved by the Owner.
- C. There is no available parking on site for the contractor's vehicles. All parking will be at the nearby garage.

1.18 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 the building in the scope of work.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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. 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.
- B. 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.

1.03 TEMPORARY PROTECTION

- A. The Contractor shall:
 - 1. Temporary enclosures shall be provided with adequate means of ventilation to prevent accumulation of moisture in the building.
 - 2. Protect sills, jambs, and heads of openings through which materials are handled.

3. 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.
 4. Protect all surfaces to receive work by other trades from any soiling which will prevent proper execution of subsequent work
 5. 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. 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 police staff, 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 ensure 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.

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 01 50 00 Temporary Facilities and any other specific requirements of the Contract Documents.

END OF SECTION

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

- D. Provide on-site containers for collection of waste materials and rubbish.
- E. At the end of each day, remove and legally dispose waste materials and rubbish from site.
- F. 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. 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. Repair, patch, and touch up marred surfaces to the specified finish, to match adjacent surfaces.
- J. Polish glossy surfaces to a clear shine.
- K. Do the final cleaning of finish floors as specified under the respective sections of the Specifications.

- L. Leave all architectural metals, hardware, and fixtures in undamaged, polished conditions.
- N. Leave pipe and duct spaces, plenums, furred spaces and the like clean of debris and decayable materials.
- M. 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.
- O. Broom clean exposed concrete surfaces and paved surfaces. Rake clean other surfaces of grounds.
- P. Ventilating systems - Replace filters and clean ducts, blowers, and coils if units were operated during construction.
- Q. Owner's responsibility for cleaning commences at Substantial Completion.

END OF SECTION

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.

LOWELL POLICE LOCKER ROOMS RENOVATION
CITY OF LOWELL
LOWELL, MASSACHUSETTS
CBI JOB NO. CB190850

CBI Consulting LLC
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 2018 or later and PDF. Electronic copies of the Architect's plans can be purchased from the Architect for a fee of \$50 per sheet and upon execution of a *CAD Release Form*. As-Builts shall be available on site for review by the Architect at any time during the project.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION - NOT USED

END OF SECTION

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:
 - 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.

SURVEY AND RECORD DRAWINGS

2. The location of all internal utilities and appurtenance, 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.
- 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 2018 or later and PDF files. Electronic copies of the Architect's plans can be purchased from the Architect for a fee of \$50 per sheet.

END OF SECTION

DIVISION 02

EXISTING CONDITIONS

SECTION 02 41 00

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.

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 Contractor is responsible for all demolition, disposal, and cleanup associated with the Work, whether or not shown on the plans or described herein required to complete the Work.
4. Selective demolition at the locker rooms
 - a. Remove and dispose of metal lockers and concrete base.
 - b. Carefully remove existing wood benches, store to be reinstalled.
 - c. Remove and disposed of existing wood doors, metal doors and respective wood and metal frames.
 - d. Sawcut and remove concrete masonry walls for new doors and room layout.
 - e. Remove and dispose of MEP systems as shown on the drawings
5. Selective demolition at the toilet room and showers
 - a. Remove ceramic tile floors, ceramic tile on selective walls and vinyl composition tile.
 - b. Remove and disposed of gypsum ceilings as shown the drawings
 - c. Remove and dispose of plumbing fixtures, toilet partitions, toilet accessories.
 - d. Remove and dispose of MEP systems as shown on the drawings.
6. Saw-cut and/or core drill openings in concrete block for new MEP systems and dispose of existing debris. Jack hammering is not acceptable.
7. Carefully remove suspended ceiling tile/grid system adjacent to the work area to accommodate new Mechanical and electrical systems.

1.03 RELATED WORK

- A. The following items of related Work are specified and included in other Sections of the Specifications:
 1. Section 22 00 00 00, Plumbing
 2. Section 23 00 00 00, HVAC
 3. Section 26 00 00 00, Electrical

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.

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 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 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.
 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 interior 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.
 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.
- 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

DIVISION 02

ASBESTOS ABATEMENT

SECTION 02 82 00

ASBESTOS ABATEMENT

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 SUMMARY OF WORK

- A. The following is the Scope of Work, at a minimum, required to be performed associated with the asbestos removal and renovation of the City of Lowell Police Department, Police Patrolmen and Superior Officer Locker Rooms, located in Lowell, Massachusetts under the base bid.

All Asbestos Abatement work under this Section shall be performed by a contractor holding a current Massachusetts Department of Labor Standards (DLS) Asbestos Abatement Contractor's license. Contractor shall furnish all labor, worker training, materials, equipment, and services for the complete and proper removal and disposal of asbestos-containing materials.

- 1. Removal and disposal of all specified asbestos-containing materials (ACM) and specified non-ACM materials as identified herein. This shall include all asbestos-containing pipe fitting insulation, 12" x 12" white floor tile with brown streaks and associated black mastic to be impacted in the upcoming renovation project.

2. Work area preparations, including required pre-cleaning, installation of critical barriers and polyethylene sheeting, construction of decontamination facilities, work area enclosures, sealing, isolation, and other activities as directed by the Owner or Consultant.
3. Installation and operation of HEPA filtration units sufficient to achieve a minimum of four air changes per hour in each containment, and according to the provisions as set forth in this Section.
4. Protection on non-ACM materials and equipment inside of work areas with two layers of 6 mil polyethylene sheeting.
5. Removal and proper disposal of all asbestos-containing 12" x 12" white floor tile and associated black will be completed in accordance with Section 3.02 of this Section.
6. Removal and proper disposal of all asbestos-containing pipe fitting insulation will be completed in accordance with either Section 3.02 or Section 3.03 of this Section.
7. Furnishing of all labor, materials, equipment, and services required for all work included under the provisions of this Section.
8. Compliance with all applicable federal, state, and local regulations, as well as all provisions set forth within this Section, and facility requirements.
9. Decontamination and clean up following removal activities in each designated work area. Clean up to include all visible debris from all surfaces present in the work areas.
10. Performance of any other work or activities required by this Section, applicable regulations, or as necessary to perform a complete job to the satisfaction of the Owner and Consultant.
11. Provide temporary electrical wiring and services as required for asbestos removal according to the Provisions as set forth in this Section.
12. Perform all selective demolition as needed to access any asbestos-containing materials and to ensure that no other suspect or hidden ACM remain in the facility prior to demolition. Contractor will perform all selective demolition as needed to the satisfaction of the consultant at any locations and items requested by the consultant during the project.

- B. Base Bid: The following is the approximate location and quantities of asbestos-containing materials to be removed, under the Base Bid, in accordance with the provisions set forth in this Section:

Table 1: Summary of Identified ACM

Location(s)	Material	Estimated Quantity	Result
Patrolmen & Superior Officer Locker Rooms			
Above Lockers	Pipe Fitting Insulation	4 ea	5% Chrysotile
Restroom Hallway	12"x12" White Floor Tile with Brown Streaks and Associated Black Mastic	75 sq ft	2% Chrysotile (Tile) 10% Chrysotile (Mastic)

sq ft = Square Feet, ln ft = Linear Feet

1.03 SEQUENCE OF WORK

- A. The following is a typical sequence of work that Contractor shall adhere to during the asbestos abatement project. Consultant may authorize deviations from this typical sequence based upon the specific conditions encountered during the project.
1. Contractor shall post all required signage.
 2. Contractor shall secure area from unauthorized access.
 3. Owner/Contractor will remove all movable objects from the work area.
 4. Contractor shall pre-clean the work area and cover all immovable objects and objects not removed from the work area with two (2) layers of six (6)-mil polyethylene sheeting, sealed airtight with duct tape. Contractor shall install critical barriers at all points of access required by regulations.
 5. Contractor shall seal all rooms that do not contain ACM with two layers of six (6)-mil polyethylene sheeting sealed airtight with duct tape.
 6. Contractor shall install HEPA filtration units sufficient to achieve a minimum of four (4) air changes per hour. All units shall exhaust to the outside of the building through windows.

7. Contractor shall prepare the specified Work Areas for total isolation/containment and perform removal of all identified ACM as described in this Section. Preparation shall include two (2) layers of six (6)-mil polyethylene sheeting, sealed with duct tape, on all floors (if applicable) and non-impervious surfaces, including all interior walls and ceilings.
8. Contractor shall construct decontamination unit, and any other construction needed to complete the work area to the satisfaction of Consultant.
9. Consultant shall inspect and approve all work area preparations before permitting Contractor to begin removal work.
10. Contractor shall remove and dispose all asbestos-containing materials as required by this Section.
11. Contractor shall decontaminate and clean up each work area upon completion of removal. Clean up of the work area will include the removal of all visible dust and debris from all surfaces in the work area.
12. Consultant shall perform a final visual inspection to assure that no visible debris exists in the work area. Contractor shall re-clean the work areas as needed until they pass a visual inspection by Consultant.
13. Contractor shall encapsulate all surfaces in the work area from which ACM was removed.
14. Consultant will perform final air clearance testing in each work area. Satisfactory results are required before containment may be removed.
15. Contractor shall remove all work area barriers, equipment, polyethylene sheeting, etc. and clean any areas to the satisfaction of Consultant and Owner.

1.04 RELATED WORK SPECIFIED ELSEWHERE

- A. The work of this section shall be performed as stated herein. In performing the work of this Section, the Contractor shall refer to other Divisions for additional procedures. The Contractor is responsible for the coordination of the work of this section with other related work.

1.05 ESTIMATES

- A. Section 1.02 represents a brief description of the estimated quantities of asbestos and asbestos-containing materials to be removed. This data is provided for informational purposes only, and is based on the best information available at the time of specification preparation. Nothing in this section may be interpreted as limiting the scope of work otherwise required by this contract and related documents.
- B. The quantities and location of ACM and the extent of work included in this section are only best estimates, which are limited by the physical constraints imposed by occupancy of the building. Accordingly, minor variations of plus or minus 15% of the estimated quantities of ACM within the limits of containment for each abatement stage are considered as having no impact on the price of this contract.

1.06 COORDINATION AND PHASING OF WORK

- A. Contractor shall coordinate all work in this Section with all other work of this Project. Where additional regulatory requirements apply to the work in this Section, the Contractor shall ensure compliance with all requirements.
- B. Contractors work schedule must be coordinated with, and acceptable to the General Contractor and approved by the Owner. Contractor shall work continuously and diligently in each work area on the days and during the hours indicated on their work schedule
- C. Contractor shall cooperate fully with other Contractors at the facility.
- D. Contractor shall subdivide work areas and/or otherwise provide additional containments and mobilization where and when necessary to accomplish asbestos abatement in accordance with the project phasing, as determined by the General Contractor, and as specified by the Owner.

1.07 SUBMITTALS

- A. Pre-Construction Meeting

The Contractor shall meet with the Owner and the Consultant for a Pre-Construction meeting prior to commencing work on the project. The meeting shall be at the facility or at the offices of the Owner, at a mutually convenient time and date. At the meeting, the Contractor shall be represented by authorized representatives and the field supervisor who shall run the project on a daily basis, and who shall present evidence that all requirements for initiation of the work have been met. The minimum agenda for the meeting shall be:

1. Review of "Pre-Job Submittals".
2. Channels of communication.
3. Construction schedule, including sequence of critical work.
4. Designation of responsible personnel.
5. Procedures for safety, security, quality control, housekeeping, etc.
6. Use of premises, facilities, and utilities.

B. PRE-JOB SUBMITTALS

The Contractor is required to provide one copy of the following Pre-Job Submittals at the Pre-construction Conference:

1. Copies of all notifications, permits, applications, personnel licenses, asbestos abatement contractor license and like documents required by Federal, State, or local regulations obtained or submitted in proper fashion,
2. List of employees to be used on this project.
3. Copies of medical records as required by OSHA or a notarized statement by examining medical doctor that such examinations took place and when for each employee to be used on project,
4. Record of successful respiratory fit test performed by a Competent person (as defined by OSHA) within the previous 6 months, as required elsewhere in the documents for each employee to be used on this project,
5. Certificate of Insurance,
6. Proposed respiratory program for employees throughout all phases of the job, including make, model and NIOSH approval numbers of respirators to be used,
7. Written description of all procedures, methods, or equipment to be utilized by the Contractor that differ from the Contract Sections, including manufacturers Sections on any equipment not specified for use by the Contract Sections,

8. Proposed electrical safeguards to be implemented, including but not limited to location of transformers, GFCI outlets, lighting, etc., necessary to safely perform the job, including a description of an electrical hazards safety plan for common practices in the work area,
9. A list of all equipment to be used on site, by make and model, including negative pressure equipment, HEPA vacuums, Water Atomizing Devices, etc.,
10. Chain of Command of responsibility at work site including supervisors, foreman, and competent person, their names, resumes and certificates of training,
11. Proposed Emergency plan and route of egress from work areas in case of fire or injury, including the name and phone number of nearest medical assistance center,
12. Contractor's testing lab, AIHA PAT proficiency, and Certification in the State where work site is located,
13. Schedule of values breaking down the work in sufficient detail so as to serve as the basis for payment, with disposal costs listed as a separate item.

C. Post-Construction Submittals

The Contractor is required to submit the following to the Consultant within thirty days after completion of the project:

1. Manifests and waste receipts acknowledging disposal of all waste material from the project showing delivery date, quantity, and appropriate signature of landfill's authorized representative,
2. A copy of the entry-exit logbook required elsewhere in these Sections,
3. All personnel monitoring results as required by OSHA and elsewhere in these Sections,
4. Copy of licenses, medical, and fit tests of all workers and supervisors who performed work on the project,
5. All notifications as required elsewhere in these Sections.

1.08 REFERENCE STANDARDS, REGULATIONS AND CODES

- A. All work shall be performed strictly according to the Sections contained herein and with the regulations cited in this Article. The Contractor undertaking asbestos abatement work and persons in their employ shall comply with and be bound to requirements of the following Federal, State, and Local standards, regulations and codes. These standards and codes shall be by reference made part of this Section and shall be complied with. Whenever regulations are conflicting, the more stringent regulation will prevail.
1. US Department of Labor; Occupational Safety and Health Act of 1970. (Particular attention is drawn to the Asbestos Regulations: CFR Title 29, Part 1910, Sec. 1910.1001 and Part 1926, Sec. 1926.1101, and the Respirator Regulations; CFR Title 29, Part 1910, Sec. 1910.134 and the Hazard Communication Program, CFR Title 29, Part 1910.1200).
 2. US Environmental Protection Agency, CFR, Title 40, Part 61, Subparts A and M, National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision; Final Rule, Dated Tuesday, November 20, 1990.
 3. US Environmental Protection Agency; TSCA Title II, Asbestos Hazard and Emergency Response Act (AHERA), 40 CFR Part 763 Subpart E - "Asbestos-Containing Materials in Schools" and also 40 CFR, Part 763, Subpart G - "Worker Protection Rule".
 4. US Department of Transportation regulations, 49 CFR Parts 172 and 173.
 5. All Commonwealth of Massachusetts laws, regulations and standards, including the regulations 453 CMR 6.00 "The Removal, Containment or Encapsulation of Asbestos" and 310 CMR 7.15 "Asbestos", 18.00 and 19.00 and MGL Chapter 21E.
 6. Other Federal, State and local statutes, ordinances, regulations, or rules pertaining to this Section and the work described herein, including the storage, transportation and disposal of asbestos.
- B. All regulations by these and other governing agencies in their most recent version are applicable. These Sections refer to many requirements found in these references, but in no way intend to cite or reiterate all provisions therein or elsewhere. It is the contractor's responsibility to know, understand, and abide by all such regulations and common practices. Other provisions contained in these references may from time to time during the execution of this contract be enforced by the Owner at his own discretion.

1.09 REGULATORY SUBMITTALS

- A. The Contractor shall be responsible for securing all necessary permits for asbestos related work, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.

The Contractor shall notify the following agencies in appropriate manner and place of impending work, and shall provide evidence of notifications at the pre-construction conference:

1. U.S. Environmental Protection Agency,
J. F. Kennedy Federal Building
Boston, Massachusetts 02203
(10 working days in advance)
2. Massachusetts Department of Environmental Protection
Division of Air and Hazardous Materials
(10 working days in advance)
Send Notification to:
Commonwealth of Massachusetts
Asbestos Program
P.O. Box 120087
Boston, Massachusetts 02112-0087
3. Massachusetts Department of Labor Standards
Asbestos Control Unit
(10 working days in advance)
4. Lowell Fire Department, Lowell Health Department, and other state or city agencies as required by law or ordinance.

1.10 PROJECT CONDITIONS

- A. Take all measures and provide all material necessary for protecting fixed machinery, controls, instrumentation, equipment, and furniture from asbestos fiber, dust and debris and from water damage.
- B. Working space and space available for storing materials is restricted within the confines of the project and/or at locations to be designated by the Owner.
- C. Provide access and personal protective equipment, including full face piece powered air-purifying respirators, to the Consultants, who are licensed and certified, to visit the Work Areas to maintain and adjust building services.

- D. Schedule the use of existing utilities with the Owner. No utility service, fire protection system, or communication system may be interrupted without prior approval of the Owner.
- E. Water, electric power, lighting and other utilities, toilets, and other facilities, shall be provided by the Owner from existing sources where Contractor's use is not excessive and does not interfere with buildings normal use. Where existing utilities of the facility are not adequate or cannot be used, the Contractor is responsible for providing alternative sources, the cost of which is to be included in bid price. The use of the Facility's utilities shall be coordinated through the Owner.
- F. Post and affix caution signs and labels as required by OSHA regulation, 29.CFR.1926.1101 (k) (1). Post safety signs outside the work project as may be required by the Owner. Obtain two copies of 29.CFR.1910.1001, 29.CFR.1926.1101, m 40.CFR.61, Subpart M, and Commonwealth of Massachusetts Regulations 453 CMR 6.00 and 310 CMR 7.00, and post one copy at the job site and retain one copy on file.
- G. Post at the job site, or at the entrance to each independent Work Area, one copy of all Safety Data Sheets (SDS's) of all chemicals and other substances to be used on this contract. These sheets shall be made available to the Consultant for review.
- H. No storage of waste will be permitted onsite. All ACM shall be removed off-site at the end of each shift except that limited storage space may be provided by the Owner at the facility. Contractor will supply any additional temporary storage as needed. All materials and equipment are to be kept in orderly fashion in designated areas, free and clear of halls and doorways, and in conformance with all regulations, codes, and in consideration of building usage.

1.11 RESPIRATORS AND PROTECTIVE CLOTHING

- A. Personal protection, in the form of disposable Tyvek suits, and NIOSH approved respirators, are required for mechanics, contractor supervision, Consultant and visitors at the work site during the set-up, removal, and cleaning operations. Contractor shall provide all this protective equipment for workers, Consultant, and authorized personnel to access this work site.
- B. Each worker shall be supplied with a minimum of two complete disposable uniforms every day. Removal workers shall not be limited to two uniforms, and the Contractor will be required to supply additional uniforms as is necessary.

Under no circumstances will anyone entering the removal area be allowed to reuse a contaminated uniform.

- C. Work clothes shall consist of disposable full body suits, head covers, gloves, footwear, and eye protection.
- D. The Contractor shall supply workers and supervisory personnel with NIOSH approved protective respirators and HEPA/filters. Appropriate respirator selection shall be determined by the daily personnel samples being taken and strictly follow the guidelines set forth in the OSHA respiratory program 29 CFR 1910.134 and the Massachusetts DLS Regulations 453 CMR 6.00. The respirators shall be sanitized and maintained according to the manufacturer's Sections. Appropriate respirators shall be selected using the information provided in OSHA Title 29 CFR Part 1910.1926 Final Rules. This determination has been made for this project. PAPR's shall be supplied by the contractor for all personnel associated with this work. Disposable respirators shall not be considered acceptable in any circumstance. The Contractor will maintain on site a sufficient supply of disposable HEPA/filters to allow workers and supervisory personnel to change contaminated filters at least three (3) times daily. The Contractor is solely responsible for means and methods used and for compliance with applicable regulations.
- E. Respirators shall be individually assigned to removal workers for their exclusive use. All respiratory protection shall be provided to workers in accordance with the written submitted respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (b) (1-11). A copy of this program shall be kept at the work-site, and shall be posted in the Clean Room of the Decontamination Unit.
- F. Workers must perform negative and positive pressure fit tests each time a respirator is put on, whenever the respirator design so permits. Powered air purifying respirators shall be tested for adequate flow as specified by the manufacturer.
- G. Workers shall be given a qualitative fit test in accordance with procedures detailed in the OSHA Lead Standard (29 CFR 1910.1025, Appendix D, Qualitative Fit Test Protocols) for all respirators to be used on this abatement project. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.
- H. Upon leaving the active work area, pre-filters shall be discarded, cartridges removed, and respirators cleaned in disinfectant solution and clean water rinse. Clean respirators shall be stored in plastic bags when not in use. The contractor shall inspect respirators daily for broken, missing, or damaged parts.

- I. Contractor shall provide daily personal sampling to check personal exposure levels for the purpose of establishing respiratory protection needs. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken every day after the first day if working conditions remain invariant, but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be to determine eight-hour Time-Weighted-Averages (TWA). The contractor is responsible for personal sampling as outlined in OSHA Standard 1926.1001.
- J. Sampling personnel shall be proficient in the taking of air samples under NIOSH 7400, and must be supervised by an individual who has completed the training course NIOSH 582 or equivalent.
- K. Air sampling results shall be available at the job site in written form no more than twenty-four (24) hours after the completion of a sampling cycle. The document shall list each sample's result, sampling time and date, person monitored, flow rate, sample duration, microscope field area, number of fibers per fields counted, cassette size and analysts name and company. Air sample analysis results will be reported in fibers per cubic centimeter.

1.12 WATER AND ELECTRICAL SERVICE

- A. The Contractor shall provide temporary connections to existing building utilities and provide temporary facilities as required and necessary to carry out the work.
- B. The Contractor shall provide temporary connections to building water service and provide all lines necessary for distribution of water.
- C. Comply with applicable NEMA, NECA and UL standards and governing regulations for materials and layout of temporary electrical service. All power connections and panel work is to be performed by a licensed electrician.
- D. The Contractor shall provide temporary service connections from power sources as required. All existing power service to the work area will be isolated and shut down for the duration of the project. Contractor shall provide service (sub-panel) with a minimum of 100 amp, two-pole circuit breaker or fused disconnect. Sub-panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion. Contractor's electricians will make all necessary connections to main power system.
- E. Provide I.D. warning signs at power outlets that are other than 110-120 volt power. Provide polarized outlets for plug-in type outlets, to prevent insertion of 110-120 volt plugs into higher voltage outlets.

- F. Provide all receptacle outlets equipped with ground fault circuit interrupters (GFCI) and reset button for plug-in connection of equipment.
- G. The Contractor must supply temporary lighting for all lighting requirements within contained areas. All existing lighting shall be isolated and shut down.

1.13 SPECIAL CONSIDERATIONS

A. Final Air Clearance Tests

- 1. All final air tests will be performed in accordance with Massachusetts DLS regulations at 453 CMR 6.00, this Section, and other applicable Rulings (i.e., AHERA). The first set of final clearance air tests for each removal area will be paid for by Owner. In the event that these air tests do not pass the clearance criteria, any subsequent air tests that need to be performed shall be paid for by Contractor. All additional sampling costs will be automatically deducted from the contract price until the areas in question pass the final air clearance criteria of less than 0.010 fibers per cubic centimeter for PCM clearance testing or an average of 70 structures per square millimeter for TEM clearance testing.

B. Exceptions to Work Area Preparation Requirements

- 1. In accordance with 453 CMR 6.14 (2) (a) (7), it will not be required to cover impervious surfaces of walls or floors with two (2) layers of polyethylene sheeting. Examples of such surfaces that may be considered to be impervious include concrete floors without any cracks or fissures and glazed walls, i.e., painted brick walls. (Note: Wooden surfaces and surfaces constructed of stone/cement are not considered impervious). If Contractor wishes to utilize this exception, Contractor shall be required to state on their Massachusetts DLS notification forms that they do not intend to use two (2) layer of polyethylene sheeting for these particular surfaces. If the Massachusetts DLS does not permit this exception, Contractor shall be required to use two (2) layers of polyethylene sheeting in full accordance with the work area preparation requirements of this Section, and will not be entitled to any additional monies of payment.

PART 2.0 - PRODUCTS

2.01 ASBESTOS ABATEMENT SUPPLIES

- A. Respirators: Respirators will be selected from those jointly approved by the National Institute for Occupational Safety and Health (NIOSH), US Department of Health and Human Services and the Mine Safety and Health Administration (MSHA), US Department of Labor.
- B. Surfactant (Amended Water): All water to be used for removal and wet wiping of asbestos-contaminated materials during clean-up operations shall be amended through the addition of a surfactant (a 50/50 mixture of polyoxyethylene ether and polyoxyethylene ester, or equivalent) mixed and supplied in accordance with manufacturer's instructions.
- C. Sealer: All surfaces from which asbestos-containing materials have been removed shall be sealed with a colored-asbestos sealer, mixed and applied in accordance with manufacturer's instructions. The proposed brand and product shall be submitted to the Consultant for approval.
- D. Polyethylene Sheeting: All polyethylene sheeting used on the Project shall be fire resistant, and shall meet and be approved as called for in local, Fire Prevention Codes
- E. Encapsulant: a bridging encapsulant such as Childer's Product Co., Chilcare CP215 bridging encasement/encapsulant; Barrier Systems Inc., Slaytex Asbestos Encasement System; CRSI/ISP Guardian Bridging encapsulant; IPC Serpiflex shield encapsulant; or equivalent shall be used. The proposed brand and product shall be submitted to the Consultant for approval.
- F. Plaster impregnated glass-fiber cloth.
- G. Mastic Remover - Sentinel 747, or approved equal

PART 3 - EXECUTION

3.01 GENERAL

A. Approvals and Inspection

1. All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet these contract Sections along with EPA, OSHA, NIOSH, regulations and recommendations as well as any other federal, state, and local regulations. Where there exists overlap of these regulations, the most stringent one applies. All work performed by the Contractor is further subject to approval of the Owner.
2. Modifications to these isolation and sealing methods, procedures, and design may be considered if all elements of proper and safe procedures to prevent contamination and exposure can be demonstrated. Written modifications to these Sections must be made to the Owner for review before they can be used for work on this project.

B. HVAC Systems

1. All duct work, heating units and HVAC equipment shall be wrapped in two layers of six-mil polyethylene prior to any other work taking place, or excluded from work area boundaries by airtight polyethylene sheeting.

C. Barriers and Isolation Areas

1. The Contractor shall construct and maintain suitable critical barriers within the building to separate work areas from spaces occupied by the Owner. Critical barriers shall be of sufficient size and strength to prevent staff, residents, the public and others from entering the work areas. Critical barriers shall be constructed at all hallways, doorways, grille openings, or other open entrances to the work area. Critical barriers shall be constructed with plywood and 2 x 4 lumber, reinforcing it, and placed in the locations specified and designated by the Owner's Representative. Any seams in the critical barriers shall be sealed airtight with caulking or an approved equal method. These barriers shall be removed by the Contractor at the completion of construction work.
2. Warning signs shall be posted on all critical barriers at the commencement of the work area preparation, as required in 1926.1101 of the Occupational Safety and Health Standards Federal Register, Volume 51, Number 119, June 20, 1986. The signs shall display the proper legend in the lower panel, with letter sizes and styles of a visibility at least equal to that

specified in OSHA Standard 1926.1101. (k)(1)(ii). The signs will read as follows:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY

3. The signs shall be posted at the perimeters of asbestos removal, demolition or construction areas where the asbestos-containing material to be removed exists.
4. The Contractor shall maintain all temporary and critical barriers, facilities and controls as long as needed for the safe and proper completion of the work. Any breaches in the containment will be corrected at the beginning of each shift and as necessary during the workday. Work will not be allowed to commence until all control systems are in place and operable.
5. No barriers shall be removed until the work areas are thoroughly cleaned and all debris has been properly bagged and removed from work areas, and the air has passed final clearance tests, in accordance with provisions detailed herein.

3.02 ACM LOCATION PREPARATION AND REMOVAL METHOD

A. Preparation

1. Primary Barriers: Prior to construction of the asbestos removal area, all primary barriers shall be sealed with a minimum of one layer of six (6) mil plastic sheeting and duct tape. Primary barriers consist of all windows, vents, closed and locked doors, and openings to adjacent spaces from the work area. HVAC systems shall be sealed, where applicable, as described previously with two layers of 6 mil polyethylene sheeting.
2. Critical Barriers: Critical barriers consist of the boundaries of the work area including floors, ceilings, walls, and any constructed barrier to restrict public access to the work area. Floors, if applicable, shall be sealed with a minimum of two layers of six (6) mil. polyethylene sheeting. There shall be a minimum overlap of two feet (24") at the floor seams and the sheeting will run a minimum of two feet (24") up the walls.
3. The containment walls shall be constructed using a minimum of two layers of six (6) mil. polyethylene sheeting after sealing the floors. This shall be done using a minimum of one layer of six (6) mil. polyethylene sheeting. Overlaps between the walls and ceiling shall be interwoven.

4. The first floor layer shall be taped down the wall a minimum of two feet (24"). The first wall layer shall be sealed to the ceiling layer at the corner of the ceiling and wall. The second and ceiling layer shall be sealed to the first wall layer at a minimum of a two foot (24") overlap. The second wall layer shall cover all overlaps and be sealed to the ceiling.
5. The enclosure shall be constructed so as to allow the removal of interior layers of plastic without damaging the exterior layer. The exterior layer shall stay intact for the duration of the project and be designated the critical barrier.

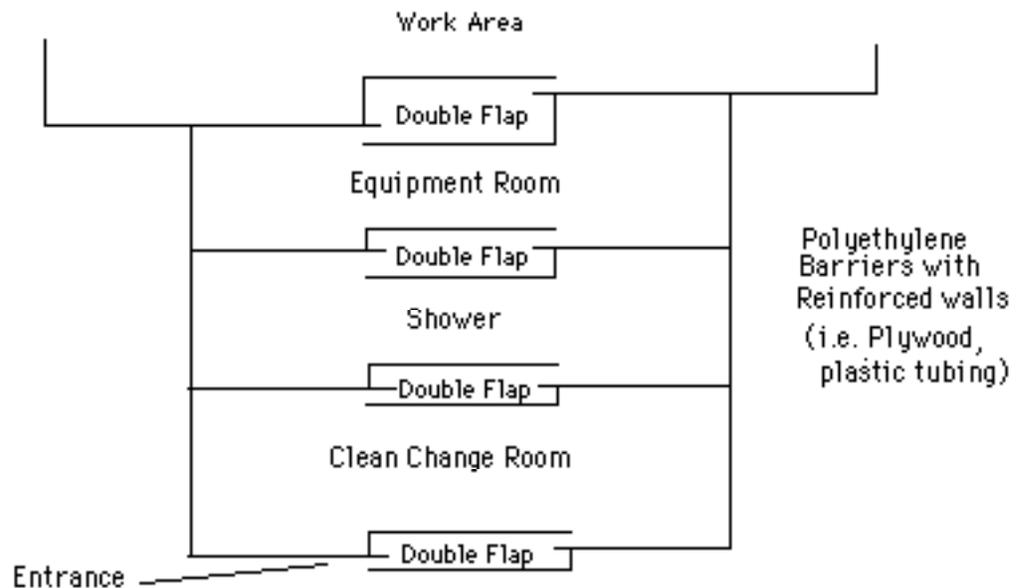
B. Decontamination Unit and Procedures

1. It is the Contractor's responsibility to provide decontamination chambers consisting of an Equipment Room, Shower, and Clean Room for personnel involved in asbestos removal. Each of the three rooms shall be of sufficient size to accommodate authorized personnel and related equipment. Each room shall be separate of other rooms by a double flap of 6 mil polyethylene sheeting acting as an airlock. This shall be designed to minimize fiber migration and air flow between the decontamination unit rooms. The rooms shall be framed with 2"x 4" lumber, masked, sealed and attached to the entry/exit ways of asbestos work areas. The three rooms together shall be referred to as the Decontamination Unit. A Decontamination Unit will be required for each separate containment area, if work is to be divided into sections.
2. The Equipment Room shall serve as a transfer room and an intermediate area between the work area and any decontamination procedures to occur in the shower room. This room shall be vacuumed and washed whenever necessary in order to prevent asbestos dust and debris accumulations or when required by Consultant. The Equipment Room will also serve as an access area to the shower for personnel leaving the work area. Workers leaving the containment shall remove and dispose of disposable protective suits and wear only respirators into the Shower. At the end of each day, bags of asbestos waste and contaminated materials shall be removed after a thorough decontamination procedure as described in the contract Sections. Workers performing this operation will wear respirators and disposable full-body protective suits.
3. The Shower Room shall have a continuous supply of cold and hot water, and be suitably arranged for complete showering during decontamination. The Shower Room with curtained doorways will comprise an airlock between contaminated and clean areas. All materials being passed from

the equipment room to the Clean Room must pass through the shower and be thoroughly decontaminated. The shower floor will not be allowed to sit at ground level, but must be elevated a minimum of six inches off of the floor with a suitable catch basin for drainage into a filtration system. The shower will be equipped with a sump pump and an in-line two stage filter. The first stage will efficiently filter fibers greater than twenty (20) microns in length and the second stage will filter bulk material and fibers greater than five (5) microns in length. Alternatively, shower water may be re-routed back into the work area to be bagged and disposed of as asbestos contaminated waste. The Contractor shall provide disposable towels and soap in the shower area.

4. The Clean Room shall store asbestos worker's clean protective clothing and clean respirator equipment. Contaminated clothing, respirators, tools, equipment, or other materials shall not be allowed into the Clean Room or beyond. The Clean Room will serve as an access for personnel entering the work area, and for the donning of respiratory protection and protective clothing. The contractor shall provide space in the Clean Room for the worker's personal clothing. This may be in the form of hangers or lockers.

TYPICAL DECONTAMINATION UNIT



5. The above decontamination enclosure is called a "three-stage" decontamination enclosure and shall be the type constructed and used for this project in specified areas. A "two stage" unit resembles the "three-stage" unit in construction detail, but it is built without a shower section.

- C. HEPA Filtration: Adequate negative pressure shall be provided within the enclosure as specified below.
1. After the work area is totally isolated, and prior to commencement of work, the Consultant will perform a visual inspection of the work area. This will consist of checking the integrity of barriers including smoke testing the containment if deemed necessary by Consultant. This does not in any way relieve the Contractor's responsibilities to ensure the isolation of the work area. The volume of air within the contained work area shall be changed a minimum of four (4) times per hour. A pressure differential reading of 0.02 inches of water shall be maintained in the negative pressure work area relative to adjacent areas. Equipment used for producing a negative pressure work area shall have a filtering device that is at least 99.97% efficient at a 0.3 micron pore size. Filters meeting these standards are referred to as High Efficiency Particulate Air (HEPA) filters.
 2. The HEPA filtration units shall be equipped with the following:
 - a. Magnehelic gauge to monitor the unit's air pressure difference across the filters and be able to interpret magnehelic reading to cubic feet per minute (CPM).
 - b. An affixed label, clearly marked and conspicuous, showing the most recent installation date and hour reading of the primary internal HEPA.
 - c. A clock to record the unit's operation time.
 - d. Automatic shut off for filter failure or absence.
 - e. Audible alarm for unit shutdown.
 - f. Amber flashing warning light for filter loading.
 - g. The unit must be equipped with a safety system which prevents it from being operated with the HEPA filter in an improper orientation.
 - h. All flexible ducting, vent tubing, adapter plates and other equipment used for the passage of filtered air shall be undamaged, uncontaminated, and free of air leaks at all points.
 3. Pre-filters shall be changed frequently during the removal.

4. Air movement will flow uninterrupted from outside the work area through the Decontamination Unit into the work area. There shall be no other openings for air to enter the containment unless approved by the Consultant in writing.
5. HEPA filtration units shall be placed as far as possible from the air intake to the containment to prevent short-cycling of fresh air.
6. This containment, along with the decontamination chamber, shall constitute the critical containment of the work area from the surrounding areas. All openings to this critical containment are to be sealed except where air must enter the work-site due to the use of exhaust equipment. Unless approved by the Owner, air shall enter the critical containment only through the Decontamination Unit.
7. Modifications to these isolation and sealing methods, procedures, and design may be considered if all elements of proper and safe procedures to prevent contamination and exposure can be demonstrated. Written modifications to these Sections must be made to the Owner for review before they can be used for work on this project.

D. ACM Removal

1. Asbestos removal will not begin until the Consultant has given authorization to proceed. This authorization will be given after the removal area has passed a visual inspection by the Consultant based on the criteria presented herein.
2. All asbestos-containing material must be soaked with amended water before removal. The material shall be sufficiently saturated to reduce fiber release so that the airborne fiber concentration does not exceed the established OSHA Permissible Exposure Limits, (PEL's). The amended water shall not be applied in amounts that will cause leakage or runoff of contaminated water from the removal area. Dry removal will not be permitted during this project.
3. Asbestos-containing material shall be carefully removed and placed immediately into bags. Bags must be filled with water to the point where all asbestos is adequately wetted as defined by Federal Regulations 40 CFR 61 Subpart M. Asbestos will not be permitted to let fall or sit on the ground before being bagged.
4. Fine cleaning of residual asbestos-containing material shall consist of carefully scraping or brushing the material from surfaces. The

recommended method for brushing a substrate after gross removal has taken place is to use a nylon brush. Wetting of the substrate shall also occur while this brushing is performed, since the chance of airborne fiber generation during fine cleaning still exists.

5. Water Atomizing Devices, commonly termed "mistifiers," shall be utilized by the contractor during asbestos removal and fine cleaning phases to provide further dust control protection in the work area. The mistifiers shall be supplied with amended water and in operation continuously during these phases.
6. Asbestos waste must be double bagged before it is removed from the contained area. The inner bag will be HEPA vacuumed and showered before being placed in the outer bag. Vacuuming must take place in the Equipment Room of the Decontamination Unit. Washing must take place in the Shower Room of the Decontamination Unit. Bags will normally be removed at the end of each working day and transported from the job site.
7. Any materials considered contaminated by the Owner or the Owner's representative that cannot be double bagged shall be wetted and containerized in disposal drums. Oversized contaminated materials (e.g., plywood subfloor, hardwood floors) shall be wrapped airtight in two layers of 6 mil polyethylene sheeting.
8. All bags, containers or wrapped materials transported out of the work area shall be labeled with preprinted labels required by Federal EPA, OSHA and the Department of Transportation regulations. Any carts used to transport asbestos waste to the on-site holding dumpster should be HEPA vacuumed and wet wiped each day, and may be inspected by the Owner or Consultant every day.
9. Carts that are not made of an impermeable material shall be lined with a minimum of one layer of six (6) mil. polyethylene sheeting to be removed after each shift and disposed of as contaminated waste. The transport route and the transport of waste out of the work area shall be coordinated with the on-site Owner's representative.
10. The work area shall be cleaned of residual asbestos debris on a daily basis. The Decontamination Unit floor (top layer) shall be picked up and replaced on a daily basis, if required by Consultant.
11. Air testing will be performed continuously outside the enclosed area. If fiber concentrations exceed 0.010 fibers/cc or background levels, work shall stop and the Contractor shall perform clean-up activities in the

affected areas and check the integrity of the critical barriers. Clean up activities shall include but not be limited to wet wiping and vacuuming surfaces with a HEPA equipped vacuum. Work may continue only after the source of contamination is identified, corrected and proper cleaning activities are implemented. Air testing will be performed by the Consultant on site in the affected areas. If the results of these air tests are not below 0.010 fibers/cc, the Contractor shall perform a thorough decontamination of the affected areas.

12. After brushing and scraping, surfaces shall be free of visible debris and fibers. A final wipe-down of the substrate with wet, lint-free rags shall take place in order to ensure proper cleaning. All surfaces including floors, walls, and ceilings shall also be HEPA vacuumed clean. All visible asbestos-containing material is to be removed by the Contractor before encapsulation procedures are allowed to begin. The Consultant will perform an inspection of the work area prior to giving approval to begin encapsulation of work area. Removal substrate must be clean and bare, and the entire work area must be free and clear of any suspect material for the contractor to pass this visual inspection and begin encapsulation.
13. Where insulated substrates penetrate walls or other demising structures, remove asbestos through to the opposite side of the demising structure. After the removal of the asbestos materials at the demising structures, any resulting spaces or breeches shall be foamed or sealed airtight.

E. Removal of Critical Barriers

1. No critical barrier shall be taken down until the final visual inspection and final clearance air tests are found to below 0.010 fibers/cc.
2. After a successful final visual inspection, encapsulation, and a successful final air test, Contractor shall perform post abatement take-down.
3. All encapsulated polyethylene sheeting used in the construction of the Decontamination Unit and Containment Area shall be bagged and disposed of as asbestos contaminated waste. Areas exposed during this process shall be examined for traces of suspect material. If any is found, it will be picked up by HEPA vacuuming and wet cleaning, and a coat of encapsulant be applied to the affected areas. Based on the amount of suspect material found, the Consultant may request the use of misters in the surrounding area. The Contractor will then implement the use of misters as a precautionary measure.

F. Encapsulation Procedures

1. The polyethylene barriers shall be cleaned of gross contamination before a lock-down sealant can be applied to the substrate. After the substrate has been cleaned and all polyethylene barriers of the work area are cleaned of all visible debris, the Contractor shall request a visual inspection of the work area by the Consultant. Prior to the inspection of the work area, the Contractor shall remove the inside layer of the work area polyethylene sheeting, after cleaning, and dispose of it as contaminated waste. The work area will still have all primary barriers intact and one layer of polyethylene sheeting over floor, walls, and permanent structures within the work area during the inspection.
2. Workers performing lock-down must wear disposable protective clothing and respirators suitable for asbestos. The encapsulation process shall not be treated any differently from the removal process in this respect.
4. The lock-down material shall be applied with a low pressure (less than 500 p.s.i.), airless spray-type mechanism.
5. All surfaces in the work area will be encapsulated. A minimum of one coat of lock-down encapsulant will be applied to prevent the generation of airborne residual fibers. The lock-down encapsulant will be applied to both the substrate and the polyethylene sheeting serving as the containment barrier. During the encapsulation process, the Contractor shall decrease the negative pressure of the work area by shutting down some of the air filtration devices in the work area. If the lock-down material is being applied to irregular, grooved, or corrugated surfaces, it shall be administered from the opposing side, or at a right angle to the direction of the previous application. The encapsulant shall be left to dry before the commencement of final air testing. After final air clearance and inspection criteria have been met, the Contractor shall begin final take-down procedures.

3.03 PIPE FITTING INSULATION REMOVAL VIA GLOVE BAG REMOVAL METHOD

- A. Removal of asbestos containing pipe fitting insulation shall be in accordance with the following procedure:
 1. Glove bags may be used as a method of asbestos removal as an alternative to total isolation removal or in conjunction with total isolation removal in areas identified in the scope of work for pipe insulation removal, but only if the area will be unoccupied during all Phases of abatement. Several

restrictions, which apply to the use of glove bags for asbestos removal purposes, may be found at OSHA Regulations 29 CFR 1926.1101.

2. Contractor shall set up a containment barrier around the immediate area of glove bag removal. This containment is to consist of two layers of six (6)-mil polyethylene sheeting walls and a two layer six-mil polyethylene sheeting floor forming a fully enclosed "cocoon"-like work area enclosure.
3. As an alternative to the "cocoon" enclosure described above, Contractor is permitted to erect a containment enclosure where all openings, windows, vents, and doors in the work area are sealed with two layers of six-mil polyethylene sheeting and duct tape. In addition, walls adjacent to the piping, floor surfaces below the piping, and any object in the work area shall be covered with two layers of six-mil polyethylene sheeting.
4. In either case, the containment area surrounding the glove bag area shall be under adequate negative pressure to achieve a minimum of four air changes per hour. Criteria for filtering and exhausting the work area shall be the same as in the total isolation method for removal.
5. Pipes and fittings where glove bags are to be used must be no warmer than 150°F, as the glove bag material may melt or stick to the pipes.
6. All workers must wear full protective suits and respirators during all Phases of glove bag work, including preparation, removal, clean up, and encapsulation.
7. Preparation of the area will include a minimum double-stage decontamination unit at the entrance to the contained area, equipped with a HEPA vacuum for personal decontamination, in accordance with OSHA 1926.1101, Appendix G. Glove bags will be placed on pipes or fittings and securely taped with tools enclosed. Bags will not have any holes, which might allow air to escape during removal. Bags will be checked with smoke tubes provided by Contractor. A HEPA vacuum will be inserted through the appropriate hole in the bag along with the nozzle for the water sprayer containing amended water. When such preparations are completed, approval of the Consultant will be obtained for each glove bag work area before removal begins.
8. It is recommended that removal be performed by two-person teams. One will support the vacuum and assist with wetting the material in the bag while the other does the actual cutting of the material. Once the material is removed and the pipes are clean and bare, the material in the bag will be thoroughly wetted down and forced to the bottom of the bag. All air in the

bag will be vacuumed out, and the bottom portion of the bag where all the asbestos must be will be twisted around before separating the bag from the pipe. Bags will then be immediately placed in another labeled bag for disposal purposes. Glove bags are not permitted to be left in the work area for any length of time after the removal.

9. All surfaces in the glove bag area will then be wet-wiped and HEPA-vacuumed. Clean up shall include all loose and peeling paint and paint chips/debris from the glove bag work area. Polyethylene sheeting used to protect the immediate area will be discarded as asbestos waste. Enclosure barriers will be left up until results of clearance air samples (if taken) are acceptable. Contractor will encapsulate the pipes and fittings for Consultant inspection.
10. Lock-down must be done with a pre-approved encapsulant, after the pipe is essentially dry. Workers performing lock-down must wear disposable protective clothing and suitable respirators. The lock-down material shall be applied with a low pressure (less than 500 psi), airless, spray-type mechanism or be hand-applied. A minimum of one coat of lock-down encapsulant will be applied. The lock-down encapsulant will be applied to both the substrate and the polyethylene sheeting, if in place. If the lock-down material is being applied to irregular, grooved, or corrugated surfaces, it should be administered from the opposing side, or at a right angle to the direction of the previous application.
11. Personal samples, containment area samples taken during glove bag operations, and/or final clearance air samples must not exceed 0.010 fibers/cc or above background levels. If this occurs, the area inside the containment must be thoroughly cleaned and encapsulated. Clearance air samples will then be taken with acceptance criteria of 0.010 f/cc required before the enclosure can be dismantled.
12. Glove bag work areas will be post-tested in the same manner and with the same acceptance criteria as specified for total isolation removal, i.e., 0.010 f/cc.

3.04 DECONTAMINATION/WORK PROCEDURES

- A. In order to avoid possible exposure to dangerous levels of asbestos, and to prevent possible contamination of areas outside the demarcated work zone, work shall follow the guidelines listed below.

1. At no time shall a worker entering the containment area go further than the Clean Room of the Decontamination Unit without a respirator and protective clothing.
2. Before leaving the work area, the worker shall remove all gross contamination and debris from the coveralls. In practice this is carried out by one worker assisting another.
3. All equipment used by the workers inside the demarcated work zone shall be either left in the Dirty Room of the Decontamination Unit or thoroughly decontaminated before being removed from the area. Extra work clothing (that in addition to the disposable garments supplied by the Contractor) shall be left in the Dirty Room of the Decontamination Unit until the completion of work in that area.
4. All persons leaving the removal area must shower before leaving the containment.
5. Under no circumstance shall workers or supervisory personnel be allowed to eat, drink, smoke, chew gum, or chew tobacco in the work area; to do so shall be grounds for the Consultant to stop all removal operations. Only in the case of life threatening emergency shall workers or supervisory personnel be allowed to remove their protective respirators while in the work area. In this situation, respirators are to be removed for as short a duration as possible.
6. As with additional clothing, all footwear shall be left inside the work area until the completion of the job, then cleaned or discarded.

3.05 DISPOSAL OF ASBESTOS WASTE

- A. Waste removal procedure shall be done in accordance with all regulations as set forth by the agencies having authority to regulate.
- B. The Contractor shall provide proof that disposal sites for the waste materials have current and valid permits to dump asbestos waste at the time of the pre-construction meeting.
- C. Receipts shall be obtained by the Contractor from the dumping site(s), and submitted to the Owner upon request for final payment.
- D. Warning labels having permanent, waterproof print and adhesive shall be affixed to all bags, trucks, drums (lids and sides), and other containers used to store

and/or transport asbestos-containing material. Labels must be conspicuous and legible and contain the following warning:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

- E. The Contractor shall be responsible for all necessary precautions to prevent pollution by spilling during the performance of services and shall assume full responsibility for all Contractor-caused spills, which shall be cleaned up at the Contractor's expense.
- F. Temporary storage of asbestos waste on-site must be approved by the Owner.
- G. Contractor is responsible for determining which ACM waste also contains excluded PCB Product so that it can be disposed of properly. Excluded PCB Product waste may be managed by any permitted asbestos waste management facility as long as they are made aware of the fact that material being sent to them contains PCBs up to the concentrations noted above and their permit allows them to accept materials with PCBs up to these levels. Facilities that can accept ACM can often accept these materials.

3.06 HOUSEKEEPING

- A. Throughout the work period, the Contractor shall maintain the building and site in a standard of cleanliness as specified throughout these Sections.
 - 1. Contaminated disposable clothing, respirator filters, and other debris shall be bagged and sealed at the end of each work day.
 - 2. All asbestos generated by either removal or repair, shall be bagged immediately and not allowed to be left exposed at the end of each work day.
 - 3. Respirators shall be thoroughly cleaned at the end of each work day and stored for the next day's use.
 - 4. The Contractor shall retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection materials.

5. The Contractor shall not allow the accumulation of scrap, debris, waste material, and other items not required for completion of the work.
6. The Contractor shall provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.
7. Daily, and more often if necessary, the Contractor shall inspect the work areas and adjoining spaces, and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
8. The Contractor shall maintain the site in a neat and orderly condition at all times.

3.07 AIR MONITORING

- A. Background (pre-testing) air and appropriate dust samples may be taken to represent conditions before the Contractor starts masking and sealing operations.
- B. During removal, area samples will be collected by the Consultant (Owner's Representative) outside major openings in the containment: in the Clean Room, at other critical points outside the work areas, just outside the Clean Room, inside the contained work sites, and at HEPA exhaust locations. Contractor shall be responsible for all OSHA personal sampling.
- C. Final clearance air samples will be collected inside the contained removal work area after all visual inspection criteria is met and the area is free and clear of any suspect material and debris. The insulation substrate, if any, must be clean and bare. The work area should be clear of any debris from various surfaces from inside the work area.
 1. Air will be agitated by means of a small leaf blower prior to the test, and kept agitated by means of a small electric fan. The results of all samples must be less than 0.010 fibers per cubic centimeter (f/cc) for PCM analysis or less than an average of 70 structures per square millimeter for TEM analysis to be in compliance with clearance criteria as described in this Section, Massachusetts DLS regulations. The first set of final clearance air tests for each removal area will be paid by the Owner. In the event that these air tests do not pass the clearance criteria, any subsequent air tests that need to be performed shall be paid for by the Contractor. If the Contractor fails to meet the criterion, the Contractor will be required to re-clean the designated work site and then the Consultant (Owner's Representative) to repeat the final air clearance testing. Cleaning and testing will be repeated until the specified criterion is met.

3.08 WORK REVIEW

- A. Consultant will review Contractor's work practices prior to the start of and during all asbestos related work and will report any Section violations to the Contractor. If the Contractor fails to correct deficiencies in a timely manner, the Owner will be notified in writing, and work may be stopped. The Consultant will review the containment structure and negative air conditions before work begins and after the Contractor Site Supervisor has given approval. Outside containment airborne fiber concentrations must not meet or exceed 0.010 fibers/cc or pre-abatement levels, whichever is greater. If concentrations exceed this level, then work must be stopped, conditions reviewed as to the probable cause, and then corrected. A description of procedures regarding fiber concentrations greater than 0.010 fibers/cc outside the containment can be found above.
- B. Consultant will keep a daily log of Contractor's work practices and will make these daily logs a part of the final project documents.
- C. In addition to various daily inspections of containment and work practices, Consultant will make three (3) mandatory inspections throughout the removal work. These inspections include: a pre-abatement visual inspection, a post-abatement visual inspection, and a post-teardown visual inspection.
- D. Each inspection must be requested by the Contractor and performed by Consultant, to the satisfaction of the Consultant, and be signed off by the Consultant, before work is to continue on to the next task in the phase. Failure on the part of the Contractor to obtain sign-off before proceeding is regarded as a serious violation of the contract and unacceptable.

END OF SECTION 02 82 00

DIVISION 02

EXISTING CONDITIONS

SECTION 02.83.00

LEAD-CONTAINING PAINT CONSIDERATIONS

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.
- B. In addition to the requirements specified herein, refer to all Contract Documents for complete description of work required to be performed under this Section.
- C. Examine all Drawings and all other Sections of the Specifications for requirements of related Sections affecting the work of this Section. A lead determination at the site indicates that various building components are considered to be lead containing.
- D. The work of this Section shall be performed as stated herein. In performing the work of this Section, the Contractor shall refer to other Sections for additional procedures. The General Contractor is responsible for the coordination of the work of this Section with related work. No delays in completion of the work shall be claimed for lack of coordination.
- E. The Contractor shall comply with all applicable Local, State, and Federal guidelines and regulations regarding all work involving the presence of lead-containing paint.
- F. The work of this Section references work of the Demolition Section. Additionally, requirements of the General Contract regarding coordination and related work are identified in this Section and shall be considered the responsibility of the General Contractor.

1.02 DESCRIPTION OF WORK

- A. The work of this Section specifies minimum requirements for the disturbance, removal, containment, and disposal of lead-containing paint and associated waste generated as a result of demolition activities.
- B. The procedures described herein apply to all demolition work where a worker may be occupationally exposed to lead as well as to the disposal of the demolition debris. The Contractor shall assume that any painted surface not tested, as included in this Section, shall be assumed to contain lead paint and it shall be the

Contractor's responsibility to protect workers performing under this Contract. This may require additional testing by the Contractor to verify lead content.

- C. The Contractor shall assume full responsibility and liability for the compliance with all applicable Federal, State and Local regulations pertaining to work practices, hauling and disposal of hazardous waste, hauling and recycling of all metal components coated with lead-containing paint, protection of workers and visitors to the site, and persons occupying areas adjacent to the site. The Contractor shall hold the Owner, Engineer, and Consultant harmless for failure to comply with any applicable work, hauling, disposal, safety, health or regulation on the part of himself, his workers or his subcontractors.
- D. The Contractor is required to ensure the protection of workers performing any related demolition work that will affect surfaces coated with lead-containing paint as well as protecting the public and the environment from exposure to lead dust.
- E. Codes and Standards
 - 1. All work shall conform to the standards set by applicable Federal, State and Local laws, regulations, ordinances, and guidelines in such form in which they exist at the time of the work on the contract and as may be required by subsequent regulations.
 - 2. In addition to any detailed requirements of the Specification, the Contractor shall at his own cost and expense comply with all laws, ordinances, rules and regulations of Federal, State, Regional and Local Authorities regarding handling and storing of lead waste material.
 - 3. The following references are cited as applicable standard and regulations as amended:
 - a. Code of Federal Regulations (CFR) Publications:
 - 29 CFR 1910 General Industry
 - 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts and Mists
 - 29 CFR 1926.57 Ventilation
 - 29 CFR 1926.62 Lead in Construction
 - 29 CFR 1926.200 Signs, Signals and Barricades
 - 29 CFR 1926.354 Welding, Cutting and Heating in Way of Preservative Coatings
 - 29 CFR Subpart T Demolition
 - 40 CFR 50 National Primary and Secondary Ambient Air Quality Standards for Lead
 - 40 CFR 61 Subpart A General Provisions

40 CFR 61.152	Standard for Waste Manufacturing, Demolition, Renovation, Spraying, and Fabricating Operations.
40 CFR 241	Guidelines for the Land Disposal of Solid Wastes
40 CFR 257	Criteria for Classification of Solid Waste
40 CFR 261 and 262	Waste Disposal Facilities and Practices

b. Massachusetts Regulations:

454 CMR 22.11	Safety Procedures for renovation
454 CMR 23.00	Occupational Lead Exposure

4. All regulations by the above and other governing agencies in their most current version are applicable throughout this project. Where there is a conflict between this Specification and the cited State, Federal, or Local regulations, the more restrictive or stringent requirements shall prevail.
5. THIS SECTION REFERS TO MANY REQUIREMENTS FOUND IN THESE REFERENCES, BUT IN NO WAY IS IT INTENDED TO CITE OR REITERATE ALL PROVISIONS THEREIN OR ELSEWHERE. IT IS THE CONTRACTOR'S RESPONSIBILITY TO KNOW, UNDERSTAND, AND ABIDE BY ALL SUCH REGULATIONS AND COMMON PRACTICES.

1.03 RELATED WORK SPECIFIED ELSEWHERE

- A. Related work specified elsewhere: Examine all Drawings and all other Sections of the Specifications for requirements of related Sections affecting the work of this Section.
- B. The work of this Section shall be performed as stated herein. In performing the work of this Section, the Contractor shall refer to other Divisions for additional procedures. The Contractor is responsible for the coordination of the work of this Section with other related work.
- C. Portions of the work herein require direct coordination with the work of the above noted Related Sections. The General Contractor shall coordinate this with the work of other trades, subcontractors and filed sub-contractors on the site.

1.04 DEFINITIONS

- A. The following definitions apply to the performance of the work of this project.
 1. Action Level: An airborne concentration of lead above 30 micrograms/cubic

- meter (μm^3) as a TWA for more than 30 days per year.
2. Area Monitoring: Sampling of lead concentrations within the work area and outside the work area which is representative of the airborne concentrations of lead.
 3. Clean Room: An uncontaminated Change Room directly adjacent to the work area having facilities for storage of employees' personal clothing and uncontaminated work clothes, materials and equipment provided when the airborne exposure to lead is above the lead Permissible Exposure Limit (PEL).
 4. Consultant: Authorized representatives who are under contract with the Owner or Engineer to perform Lead Paint Consulting services.
 5. Decontamination Area: A contained area adjacent to or connected to the work area and consisting of an Equipment Room, Shower Area, and Clean Room which is used for decontamination of workers, materials and equipment.
 6. HEPA Filter Equipment: High efficiency particulate air (HEPA) filtered vacuuming or exhaust ventilation equipment with a UL 586 filter system. Filters shall be of 99.97 percent efficiency for retaining 0.3-micrometer diameter particles.
 7. Lead Containing Paint: Paint, varnish, or stain that contains lead in excess of 0.0 mg/cm² or 0.0% lead by weight.
 8. Lead Permissible Exposure Limit (PEL): 50 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air, based upon an 8-hour time weighted average.
 9. Sample Location: Area or place where an air sample is collected.
 10. Time Weighted Average (TWA): The TWA is an 8-hour time weighted average for the test of the concentration of lead for worker exposure.
 11. Wet Cleaning: The process of removing lead contamination from building surfaces, equipment and other objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning tools as lead contaminated wastes.
 12. Work Area: A controlled-access work area which has plastic sheeting or other containment barriers erected to separate the trades.

1.05 SUBMITTALS

A. Notifications

1. Provide in proper and timely fashion, all necessary notifications to relevant Federal, State, and Local authorities and obtain and comply with provisions of all permits or applications required by the work specified, as well as make all required submittals required under those auspices. Contractor shall indemnify Owner, Engineer and Consultant from, and pay for all claims resulting from failure to adhere to these provisions. Costs for all permits, applications, and the like are to be assumed by Contractor.

B. Provide five (5) copies of the following Submittals at the Pre-Construction Conference for the review of the Owner, Engineer and General Contractor:

1. Copies of all notifications, permits, applications, licenses and like documents required by Federal, State, or Local regulations and this specification obtained or submitted in proper fashion,
2. Copies of written medical opinions for each employee who may be occupationally exposed to lead as required by 29 CFR 1926.62 (j) (3) (v),
3. Employer's Lead Compliance Program as required by 29 CFR 1926.62, including proposed worker training, respiratory protection program and medical monitoring for all employees throughout all phases of the job, including make, model and NIOSH approval numbers of respirators to be used; worker orientation plan; written description of all proposed procedures, methods, or equipment to be utilized, including those that may differ from the Contract Specifications. In all instances, Contractor must comply with all applicable Federal, State and Local regulations.
4. Proposed number and type (i.e., hazardous waste or non-hazardous waste, open top, front loading, etc.) of dumpsters for waste, proposed location(s),
5. A list of all equipment to be used on site, by make and model,
6. Chain of Command of responsibility at work site including supervisors and competent person, their names, resumes and phone numbers,
7. List of total number of supervisors and workers intended to be assigned to the project, including name and lead awareness qualifications,

8. Safety Data Sheets (SDS) on potentially hazardous materials to be used on the project,
9. Waste Disposal Plan which describes the waste stream and the disposal means (i.e. landfill, recycle, etc.) and includes the name, address, and ID number of the proposed hazardous waste hauler, waste transfer route, and proposed disposal reclamation or treatment facility,
10. Name and address of the proposed construction debris site,
11. Name and address of the proposed metal component construction debris recycling site, including letter stating such site accepts such waste,
12. Construction schedule including sequence of critical work.

NOTE: No work of the project will be allowed to begin until Owner, Engineer, and General Contractor as listed herein accepts the Pre-Construction Submittals. Any delay caused by the Contractor's refusal to submit this documentation in a timely fashion does not constitute a claim for extra compensation or a time extension.

- C. Submit the following to the Owner, Engineer, and General Contractor as a Post-Construction submittal package:
 1. Copies of waste manifests and receipts acknowledging disposal and recycling of all lead waste material from the project, showing delivery date, quantity, and appropriate signature of landfill's authorized representative,
 2. Massachusetts Department of Environmental Protection (MassDEP) approval for all waste reduction techniques, if utilized,
 3. A notarized copy of the daily list of workers and site entry-exit logbook,
 4. All personnel monitoring results,
 5. All Toxicity Characteristic Leaching Procedure (TCLP) testing results.

1.06 GENERAL WORK PROCEDURES

- A. Work shall be carried out in sequential phases. Inspection and approval of each phase by the Engineer shall be sought and gained before proceeding to the next phase and in accordance with the schedule agreed upon by Owner and General

Contractor at the Pre-Construction meeting as amended. This shall include demolition requirements for work area clearance and work area release prior to general construction work. As a Contract requirement, any reasonable delay caused by this requirement will not constitute a basis for claim against the Owner, Engineer, or Consultant. Contractor must coordinate the work of this Section with the work of the General Contractor and all other trades.

- B. At no time will Owner permit storage of debris generated from demolition activities to be stored inside buildings at the site, and any storage of materials shall be subject to Owner's approval. Assure security of debris at all times.
- C. The working hours for this project will be determined in the Pre-Construction meeting.

1.07 SPECIAL CONSIDERATIONS

- A. Testing References
 - 1. Testing for lead paint has been performed on a representative number of painted components in the areas scheduled for renovation work using XRF Analysis. Lead containing paint **was** detected on some of the representative wood, brick and metal surfaces tested throughout the buildings. These surfaces included:
 - interior metal door frames;
 - interior metal radiators;
 - 2. Testing results are found in Article 1.8.
- B. The Contractor shall follow the requirements of this Section regarding component removal, demolition, worker exposure and protection, work area cleaning, and waste disposal.
- C. Work Affected: In general, the following activities are minimum requirements of this Section and affect the demolition performed on the painted components:
 - 1. No torch cutting, mechanical sanding or stripping or abrasive methods of paint removal shall occur.
 - 2. No demolition or renovation activities shall occur which increase the workers' exposure above the Action Level of 30 $\mu\text{g}/\text{m}^3$. Contractor shall fully comply with the Occupational Safety and Health Administration (OSHA) lead standard at 29 CFR 1926.62.

3. Workers shall be informed of the components to be impacted during renovation or demolition that have been identified as containing lead.
4. Worker protection, at a minimum, shall comply with the OSHA Lead Standard 29 CFR 1926.62. Worker Right to Know and Health and Safety Standards of 1926.62 shall also apply to the work of this Section.
5. Separation of Trades: Unprotected, untrained workers or trades shall not perform any related work within the same vicinity as work involving components identified with lead.
6. Clean-up Activities: The Contractor shall maintain work zones free of accumulated debris and paint chips of demolition involving lead.

1.08 REPORT OF FINDINGS

- A. The following table identifies various components identified as containing lead in excess of 0.0 mg/cm² at the building. These components fall under the purview of the OSHA. OSHA recognizes any XRF reading above 0.0 mg/cm² as a lead-**containing** paint and a possible exposure hazard to workers impacting those coated surfaces. It requires contractors and their employees to comply with the OSHA lead in construction standard found at 29CFR1926.62.

**Table 1: Lead Paint Testing Results by XRF
 Lowell Patrolmen & Superior Officer Locker Rooms
 City of Lowell
 Lowell, Massachusetts**

Location	Component	Substrate	Color	XRF Results (mg/cm ²)
Patrolman Restroom Hallway	Door Frame	Metal	Light Green	0.3
	Door	Metal	Light Blue	0.0
	Wall	Plaster	Light Green	-0.1
Patrolman Restroom	Partition Walls	Metal	Tan	-0.1
	Ceiling	Plaster	White	-0.1
	Wall	Tile	White	-0.3
Patrolman Locker Room	Door Frame	Metal	Light Green	-0.1
	Wall	CMU	Light Green	-0.1
	Lockers	Metal	Tan	0.0
	Wall	Concrete	Light Green	0.0
	Radiator	Metal	Light Green	0.1
	Door	Metal	Dark Blue	0.0
	Door Frame	Metal	Dark Blue	0.4
Superior Officer Locker Room	Door Frame	Metal	Dark Blue	0.0
	Door	Metal	Dark Blue	-0.1

Location	Component	Substrate	Color	XRF Results (mg/cm ²)
Superior Officer Restroom	Wall	CMU	White	-0.1
	Wall	Concrete	White	0.0
	Lockers	Metal	Tan	0.0
	Door Frame	Metal	White	0.1
	Partition Wall	Metal	Tan	-0.2
	Wall	Tile	White	-0.3

1.09 FEES, PERMITS & LICENSES

- A. The Contractor shall pay all licensing fees, royalties, and other costs necessary for the use of any copyrighted or patented product, design, invention, or process in the performance of the work specified in this Section. The Contractor shall be solely responsible for costs, damages, or losses resulting from any infringement of these patent rights or copyrights. The Contractor shall hold the Owner or the Engineer harmless from any costs, damages, and losses resulting from any infringement of these patent rights or copyrights. If the Specification requests the use of any product, design, invention, or process that requires a licensing, patent or royalty fee for use in the performance of the job, the Contractor shall be responsible for the fee or royalty fee and shall disclose the existence of such rights.
- B. Contractor shall be responsible for costs for all licensing requirements, where applicable and notification requirements and all other fees related to the Contractor's ability to perform the work in this Section.
- C. Secure all necessary permits for work under this Section, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.

1.10 CLEAN-UP

- A. Maintain the work site in a neat and orderly manner at all times, so as not to interrupt or infringe upon the work of other trades.
- B. Comply with all requirements for release of work areas as described in the project specification.
- C. It is the prerogative of the Owner and/or the Engineer to inspect whenever deemed necessary and the Contractor is responsible for meeting and correcting any deficiencies discovered which do not meet the current applicable regulations and requirements of these specifications.

1.11 COORDINATION

- A. Extend full cooperation to Owner in all matters involving the use of Owner's facilities. At no time shall Contractor cause or allow to be caused conditions which may cause risk or hazard to the general public or conditions that might impair safe use of the facility. The use of the facility's electricity, water or like utilities by the Contractor shall be as specified in Division 1.
- B. Coordinate the work of this Section with that of all other trades. Phasing and scheduling of this project shall be subject to the approval of the Owner. The work of this Section shall be scheduled and performed so as not to impede the progress of the project as a whole. Work shall not proceed in any area without the express consent of the Engineer.
- C. Unless specifically authorized by the Owner, the work of this project shall be conducted in accordance with the working hours agreed upon in the Pre-Construction Meeting.
- D. Inspections: The Engineer may perform visual inspections during the work of this Section, as described below. Contractor shall not proceed with work until Contractor has received Engineer's approval at the stages identified below:
 - 1. Post Inspection: At the completion of work and final clean-up, prior to clearance or removal of any critical barriers and decontamination unit from the work area.
 - 2. Waste Removal Inspection: Prior to removal of hazardous waste from the site, Owner and Engineer will inspect the quantity and type.

1.12 EMERGENCY PRECAUTIONS

- A. The Contractor shall establish emergency and fire exits from the work area.
- B. When an injury occurs, the Contractor shall stop work until the injured person has been removed from the work area.

1.13 DISPOSAL OF WASTE MATERIAL

A. General

1. The Contractor shall comply with the Resource Conservation and Recovery ACT (RCRA) and with all applicable state and local regulations.
2. Contractor shall be responsible for disposing of all metallic waste and components determined to be coated with Lead-containing paint (LBP) by separating and recycling.
3. Contractor shall be responsible for disposing of all non-metallic waste determined by TCLP to be hazardous. If TCLP testing has not been performed, the Contractor shall be responsible for testing the waste.
4. Contractor shall comply with all Environmental Protection Agency (EPA) regulations.

PART 2 - PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. The Contractor shall deliver all materials and equipment to the site in the original containers bearing the name of the manufacturer, and details for proper storage and use.
- B. All materials or equipment delivered to the site shall be unloaded, temporarily stored, and transferred to the work area in a manner that shall not interfere with other trades working in the area.
- C. Unloading and temporary storage sites, and transfer routes, must be approved in advance by the owner.
- D. Damaged or deteriorated materials may not be used and must be promptly removed from the premises. Material that becomes contaminated shall be packaged and legally disposed in an approved, secure landfill.

2.02 MATERIALS

- A. All materials and equipment proposed to be used on this project shall be subject to the acceptance of the Owner and the Engineer. The required materials shall include, but not necessarily limited to the following:
 - 1. Fire retardant polyethylene sheeting, minimum thickness of six (6)-mil.
 - 2. Plastic bags, minimum thickness of six (6)-mil.
 - 3. Duct Tape, up to 3 inch width
 - 4. Lead Warning Signs, as required by Section 3.02, the Massachusetts Department of Labor Standards (DLS) Regulations, and OSHA Hazard Communication requirements.
 - 5. Flexible duct for ventilation units (if required)
 - 6. Spray adhesive, fire retardant
 - 7. Personal Protective Equipment, NIOSH approved respirators
 - 8. Ventilation units with HEPA filtration and exhaust fans.

9. HEPA vacuums
10. Tri-sodium Phosphate (TSP) and product data
11. Cloth tarpaulin

2.03 TOOLS AND EQUIPMENT

- A. **Transportation Equipment:** Transportation equipment, as required, shall be suitable for loading, temporary storage, transporting, and unloading waste without exposure to persons or property. All over-the-road transportation equipment must carry the appropriate hazardous waste transport licenses and insurance.
- B. **Vacuum Equipment:** All vacuum equipment utilized in the work area shall utilize HEPA filtration systems.
- C. **Water Sprayer:** The water sprayer shall be an airless or other low-pressure sprayer for water application.
- D. **Other Tools and Equipment:** The Contractor shall provide other suitable tools including but not limited to: rounded edge shovels, rakes, brooms, and carts.
- E. The Contractor shall provide ground fault circuit interrupters (GFCI) to protect all electrical cord and connections.
- F. Approved lighting equipment for use in the work area.
- G. **Scaffolding:** Scaffolding, as required to accomplish specified work, shall meet all applicable Federal, State and Local safety regulations and used in accordance with manufacturer's specifications.

PART 3 - EXECUTION

3.01 SCHEDULING

- A. The Contractor shall coordinate all scheduling with the Owner and Engineer. A schedule of work shall be submitted to the Owner, prior to contract performance.

3.02 UTILITIES

- A. Provide all necessary connections for temporary utilities in the workplace during work. Shut down and disconnect all electrical power to the work area so that there is no possibility of reactivation and electrical shock during the work. The temporary electrical power shall be in accordance with all OSHA requirements.

3.03 IDENTIFICATION OF HAZARDS

- A. Prior to any work involving lead-containing items, the Contractor shall identify all work activities in which a worker may be occupationally exposed to lead.
- B. The Contractor shall initially determine if any worker may be exposed to lead above the action level.

3.04 BARRIERS AND ISOLATION AREAS

- A. Containment controls (including critical barriers, protective coverings, HEPA-filtered ventilation and decontamination facilities), may be required for demolition work. The degree of containment shall be appropriate for the anticipated levels of airborne lead dust. The lower the level of airborne lead, the lesser the requirements necessary to control lead emissions at the job site.
- B. Work Area Isolation (unless exempted according to Paragraph A)
 - 1. The Contractor shall isolate work areas for the duration of work by completely sealing off all openings in the work area. Isolation scaling shall be accomplished by constructing critical barriers where necessary around the work area perimeter. The work area shall be sealed airtight to the greatest extent possible.
 - 2. Provide temporary power and lighting (with ground fault circuit interrupt protection) to the work areas, and ensure safe Installation of temporary power sources and equipment per applicable electrical code requirements, and OSHA requirements for temporary lighting in the environment normal to demolition areas.

- C. Equipment and Services: The Contractor shall provide portable lighting, staging and scaffolding, utility hook-ups, portable fire extinguishers, first aid equipment, and all other equipment or items for the safe and efficient performance of Work.
- D. Decontamination Facility:
1. The Contractor shall erect one or more Decontamination Facilities (if applicable) to serve each work area. The facility will consist of series of two or more connected chambers including, at a minimum, a Clean Room and a Shower/Wash Room, separated by an air lock. Unless otherwise specified, the Shower/Wash Room shall be contiguous to the work area. Non-contiguous, remote, three-chamber decontamination facilities may be substituted with the Consultant's prior written approval. Three-chamber decontamination facilities shall include an Equipment Room to be used for removal and temporary storage of contaminated worker clothing, equipment, and other items leaving the work area, prior to decontamination in the Shower/Wash Room of the decontamination facility.
 2. In all cases, non-emergency access between contaminated and uncontaminated rooms or areas shall only be through the Decontamination Facility/Wash Room.
 3. Ensure that barriers and linings are effectively sealed and taped at all times, and that the Shower/Wash Room floor is completely watertight. Repair damaged barriers, and remedy defects immediately upon discovery. Visually inspect enclosures at the beginning of each work period.
- E. All lead in demolition work areas shall remain isolated from all other trades on the project and remain inaccessible to the public. Contractor shall monitor the access to the demolition work areas. The below listed items are required to control the generation of lead-containing dust during demolition activities if worker exposure is above the PEL. The Contractor is ultimately responsible for cleaning all generated dust and paint debris from demolition operations and must maintain work areas free from lead dust generated from demolition activities.
1. Signs shall be posted at all approaches to the work area warning that work involving lead is being conducted in the vicinity. Signs shall be in bold lettering not smaller than two inches tall.
 2. Barriers shall not be removed until the work areas are thoroughly cleaned and approved by the Consultant.

3.05 APPROVALS AND INSPECTIONS

- A. All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet this Section along with EPA, OSHA, regulations and recommendations as well as Federal, State, and Local regulations. Where there exists overlap of these regulations, the most stringent one applies. All work performed by the Contractor is further subject to approval of the Owner and/or Engineer.

3.06 PERSONNEL SAMPLING – CONTRACTOR

- A. Perform personnel air sampling during all demolition work to determine worker exposure limits. The results of such sampling shall be posted, provided to individual workers, and submitted to Owner and Consultant as described herein.
- B. Provide sampling to check personal exposure levels. Representative sampling shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken for repeated working conditions if working conditions remain unchanged, but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be used to determine eight-hour TWA. Personal sampling shall be as outlined in OSHA Standard 29 CFR 1926.62.
- C. Air sampling results shall be transmitted to the Owner and individual workers available at the job site in written form no more than forty-eight (48) hours after the completion of a sampling cycle. The reporting document shall list each sample's result, sampling time and date, personnel monitored and their social security numbers, flow rate, sample duration, sample yield, cassette size, and analyst's name and company, and shall include an interpretation of the results. Air sample analysis results will be reported in micrograms/cubic meter ($\mu\text{g}/\text{m}^3$).
- D. The Contractor's testing lab shall be AIHA accredited for analysis of metals. Contractor shall submit for Owner's review and acceptance the name and address of the laboratory, certification(s) of AIHA accreditation for metal analysis, listing of relevant experience in air lead analysis, and presentation of a documented Quality Assurance and Quality Control program.
- E. Air monitoring frequency will be established in accordance with the requirements set forth in 29 CFR 1926.62.

3.07 WORK PROCEDURES

- A. The Contractor shall initiate, and continue, sufficient engineering and work practice controls, as described in the Contractor's Lead Compliance Program, to reduce and maintain worker exposures to lead at or below the Action Level.
- B. The following work practices are specifically required by these specifications:
 - 1. All persons except those directly involved in the work shall be excluded from the work area. Physical barriers shall be used, where necessary, to limit access to the work area for the duration of the demolition operations. (Warning signs may need to be posted in accordance with applicable regulations.)
 - 2. Provide hand washing facilities and assure that all workers thoroughly wash their hands and face upon exiting the work area. Workers shall pay careful attention to cleanse the hands and face when decontaminating (Provide hygiene facilities, including shower, as required based on initial assessment and continued monitoring.)
 - 3. Thoroughly wet the areas to be demolished and mist the air to reduce the potential for creating airborne lead and dust.
 - 4. All equipment used by the workers inside the work area shall be either left in the work area or thoroughly decontaminated before being removed from the area. Extra work clothing (in addition to the disposable suits supplied by the Contractor) shall be left in the clean area until the completion of work in that area. The clean area shall be cleaned of all visible debris and disposable materials daily.
 - 5. Under no circumstances shall workers or supervisory personnel eat, drink, smoke, chew gum, or chew tobacco in the work area; to do so shall be grounds for the Engineer to stop all demolition operations. Only in the case of life threatening emergency shall workers or supervisory personnel be allowed to remove their protective respirators, if applicable, while in the work area. In this situation, respirators are to be removed for as short a duration as possible.

3.08 DEMOLITION PROCEDURES

- A. Feasible engineering controls shall be implemented by the Contractor as described in the Lead Compliance Program to minimize the possibility of contamination of areas adjacent to the work area. The following activities are the minimum

requirements of this Section and affect the demolition performed on the painted components:

1. No torch cutting, mechanical sanding or stripping or abrasive methods of paint removal shall occur.
 2. No demolition activities may occur which increase the workers exposure above the Action Level of $30 \mu\text{g}/\text{m}^3$. Contractor shall fully comply with the OSHA lead standard 29 CFR 1926.62.
- B. Workers shall be informed of the components to be impacted during demolition that are identified as containing lead.
- C. Separation of Trades: Unprotected, untrained workers or trades shall not perform any related work within the same areas as demolition involving components identified as containing lead. Other trades may not enter these areas until clean-up procedures are completed.

3.09 STORAGE OF WASTE

- A. Use of waste and recycling containers on site shall be controlled under the following requirements:
1. Location of waste and recycling containers on site shall be coordinated with the Contractor, subject to Owner's approval.
 2. Waste containers shall be lined with two layers of six-mil polyethylene sheeting, be solid, enclosed containers, locked and sealed at all times. This requirement applies to waste classified as hazardous based on TCLP testing.
 3. Contractor shall comply with all Federal, State, and Local regulations and ordinances regarding lead waste and recyclable storage.

END OF SECTION 02 83 00

DIVISION 03

CONCRETE

SECTION 03 05 16

UNDERSLAB VAPOR BARRIER

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.
- 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 Underslab Vapor Barrier work required to complete the work of the contract including all the Underslab Vapor Barrier work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Underslab Vapor Barrier work with all the other trades for the project. Provide all demolition and disposal work to complete the Underslab Vapor Barrier 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Underslab Vapor Barrier work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Underslab Vapor Barrier work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Sheet vapor barrier under concrete slabs on grade where plumbing trenching occurs.

1.03 RELATED REQUIREMENTS

- A. Section 03 20 00 - Concrete Reinforcing.
- B. Section 03 30 00 - Cast-in-Place Concrete: Preparation of subgrade, granular fill, placement of concrete.
- C. Section 07 21 00 - Thermal Insulation.

1.04 REFERENCE STANDARDS

- A. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2011 (Reapproved 2017).
- B. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products.
- C. Samples: Submit samples of underslab vapor barrier to be used.
- D. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Underslab Vapor Barrier:
 - 1. Water Vapor Permeance: Not more than 0.010 perms, maximum.
 - 2. Complying with ASTM E1745 Class A.
 - 3. Thickness: 15 mils.
 - 4. Basis of Design:
 - a. Stego Industries LLC; Stego Wrap Vapor Barrier (15-mil):
www.stegoindustries.com/#sle.
 - b. Approved Equal.
- B. Accessory Products: Vapor barrier manufacturer's recommended tape, adhesive, mastic, etc., for sealing seams and penetrations in vapor barrier.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surface over which vapor barrier is to be installed is complete and ready before proceeding with installation of vapor barrier.

3.02 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E1643.
- B. Install vapor barrier under interior slabs on grade; lap sheet over footings and seal to foundation walls.
- C. Lap joints minimum 6 inches.
- D. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions.
- E. No penetration of vapor barrier is allowed except for reinforcing steel and permanent utilities.
- F. Repair damaged vapor retarder before covering with other materials.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 20 00

CONCRETE REINFORCING

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.
- 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 Concrete Reinforcing work required to complete the work of the contract including all the Concrete Reinforcing work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Concrete Reinforcing work with all the other trades for the project. Provide all demolition and disposal work to complete the Concrete Reinforcing 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Concrete Reinforcing work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Concrete Forming and Accessories work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Reinforcing steel for cast-in-place concrete.
 - b. Supports and accessories for steel reinforcement.

CONCRETE REINFORCING

1.03 RELATED REQUIREMENTS

- A. Section 03 05 16 - Underslab Vapor Barrier.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 05 50 00 - METAL FABRICATIONS.

1.04 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; 2016.
- B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2017).
- C. ACI SP-66 - ACI Detailing Manual; 2004.
- D. ASTM A1094/A1094M - Standard Specification for Continuous Hot-Dip Galvanized Steel Bars for Concrete Reinforcement; 2016.
- E. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2017.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- G. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2017.
- H. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
- I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- J. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2011.
- K. CRSI (DA4) - Manual of Standard Practice; 2009.
- L. CRSI (P1) - Placing Reinforcing Bars; 2011.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301.
- B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Plain type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.
- C. Locate reinforcing splices not indicated on drawings at point of minimum stress.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Dowels shall be tied in place prior to placing concrete. Do not install reinforcing after concrete is placed by inserting into forms.
- C. Install anchor bolts, steel bearing plates, angles and other items furnished under other Sections for building into concrete.
- D. All slab reinforcing shall be positioned in place and fully supported on slab bolsters.
- E. Do not displace or damage vapor barrier.
- F. Accommodate placement of formed openings.
- G. Maintain concrete cover around reinforcing as follows:
 - 1. Slabs on Fill: 1.5 inch.

H. Comply with applicable code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

- A. The Engineer may select a qualified Testing Laboratory or Materials Engineer to make inspection tests during the course of work as specified herein and as otherwise considered necessary. Costs of all tests will be paid by the Owner and are not included in the Contract Sum.
- B. All measuring, mixing, placing and curing may be subject to inspection by the Laboratory and approval by the Consultant. However, such inspection and approval shall in no way relieve Contractor of his responsibility to fulfill the requirements of this Contract.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

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.
- 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 Cast-in-Place Concrete work required to complete the work of the contract including all the Cast-in-Place Concrete work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Cast-in-Place Concrete work with all the other trades for the project. Provide all demolition and disposal work to complete the Cast-in-Place Concrete 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Cast-in-Place Concrete work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Cast-in-Place Concrete work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Slab on grade.
 - b. Joint devices associated with concrete work.

c. Concrete curing.

1.03 RELATED REQUIREMENTS

- A. Section 03 05 16 - Underslab Vapor Barrier.
- B. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
- C. Section 03 20 00 - Concrete Reinforcing.
- D. Section 03 35 11 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.
- E. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.04 REFERENCE STANDARDS

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- E. ACI 305R - Guide to Hot Weather Concreting; 2010.
- F. ACI 306R - Guide to Cold Weather Concreting; 2016.
- G. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- H. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).
- I. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.
- J. ASTM C40/C40M - Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- L. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- M. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2014a.
- N. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric); 2014.
- O. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
- C. Mix Design: Submit proposed concrete mix design.
 - 1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
 - 2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
- D. Test Reports: Submit report for each test or series of tests specified.
- E. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.
- F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
- G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.
 - 1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 20 00.

2.02 CONCRETE MATERIALS

- A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.
 - 1. Acquire cement for entire project from same source.
- B. Blended, Expansive Hydraulic Cement: ASTM C845/C845M, Type K.
 - 1. Manufacturers:
 - a. CTS Cement Manufacturing Corporation; Type K Cement:
www.ctscement.com/#sle.
 - b. Approved Equal.
- C. Fine and Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Organic content shall be determined according to ASTM C40, and supernatant liquid above test sample shall show color no darker than reference standard color solution prepared at same time.
 - 3. Grading for fine aggregate shall be uniform, and fineness modulus shall never vary more than 0.15 from that of sample used in design mixes.
- D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.03 ADMIXTURES

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Admixtures causing accelerated setting of cement in concrete such as calcium chloride shall not be used.
- C. Air Entrainment Admixture: ASTM C260/C260M.
 - 1. Manufacturers:
 - a. Euclid Chemical Company; Eucon AEA-92:
www.euclidchemical.com/#sle.
 - b. GCP Applied Technologies; Daravair 1000: www.gcpat.com/#sle.
 - c. Master Builders Solutions by BASF; MasterAir AE 90:
www.master-builders-solutions.basf.us/en-us/#sle.
 - d. Approved Equal.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
 - 1. Water reducing agent shall be by same manufacturer as air entraining agent.
 - 2. Manufacturers:
 - a. Euclid Chemical Company; Plastol Series:
www.euclidchemical.com/#sle.
 - b. GCP Applied Technologies; ADVA 140M: www.gcpat.com/#sle.
 - c. Master Builders Solutions by BASF; MasterGlenium 7500 or 7620:
www.master-builders-solutions.basf.us/en-us/#sle.

- d. Approved Equal.
- E. Calcium Nitrite Corrosion Inhibiting Admixture:
 - 1. ASTM C494/C494M, Type C.
 - 2. Manufacturers:
 - a. Euclid Chemical Company; EUCON CIA:
www.euclidchemical.com/#sle.
 - b. GCP Applied Technologies; DCI, DCI S: www.gcpat.com/#sle.
 - c. Master Builders Solutions by BASF; MasterLife CI 30:
www.master-builders-solutions.basf.us/en-us/#sle.
 - d. Approved Equal.

2.04 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 - 1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Normal Weight Concrete:
 - 1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
 - 2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
 - 3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.
 - 4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.
 - 5. Cement Content: Minimum 480 pounds per cubic yard.
 - 6. Water-Cementitious Ratio: Maximum 40 percent by weight.
 - 7. Total Air Content: 5-7 percent, determined in accordance with ASTM C173/C173M.
 - 8. Maximum Slump: 4 inches.
 - 9. Maximum Aggregate Size: 3/4 inch.

2.05 MIXING

- A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

- A. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Use latex bonding agent only for non-load-bearing applications.
- B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.
- C. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.
 - 1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

3.03 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Place concrete for floor slabs in accordance with ACI 302.1R.
- C. Notify Architect not less than 24 hours prior to commencement of placement operations.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Ensure reinforcement, inserts, waterstops, and embedded parts will not be disturbed during concrete placement.
- F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

- G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 FLOOR FLATNESS AND LEVELNESS TOLERANCES

- A. Maximum Variation of Surface Flatness:
 - 1. Exposed Concrete Floors: 1/4 inch in 10 feet.
 - 2. Under Seamless Resilient Flooring: 1/4 inch in 10 feet.
 - 3. Under Carpeting: 1/4 inch in 10 feet.
- B. Correct the slab surface if tolerances are less than specified.
- C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.05 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.
- C. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
 - 1. Surfaces to Receive Thick Floor Coverings: "Wood float" as described in ACI 302.1R; thick floor coverings include quarry tile, ceramic tile, and Portland cement terrazzo with full bed setting system.
 - 2. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
- D. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.06 CURING AND PROTECTION

- A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 - 1. Normal concrete: Not less than seven days.
 - 2. High early strength concrete: Not less than four days.
- C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- D. Surfaces Not in Contact with Forms:
 - 1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and

adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than five days by saturated burlap.
 - a. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.
3. Final Curing: Begin after initial curing but before surface is dry.
 - a. Moisture-Retaining Sheet: Lap strips not less than 3 inches and seal with waterproof tape or adhesive; secure at edges.
 - b. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.07 FIELD QUALITY CONTROL

- A. The Engineer may select a qualified Testing Laboratory or Materials Engineer to make inspection tests during the course of work as specified herein and as otherwise considered necessary. Costs of all tests will be paid by the Owner and are not included in the Contract Sum.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- D. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.08 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.
- B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- C. All concrete not conforming to these requirements will be condemned by the Consultant and shall be properly and promptly removed and replaced with new work to the satisfaction of the Consultant, at no additional cost to the Owner.

- D. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- E. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.09 PROTECTION

- A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

DIVISION 04

MASONRY

SECTION 04 20 00

UNIT MASONRY - FILED SUB-BID

FILED SUB-BID REQUIRED - MASONRY

PART 1 GENERAL

1.00 FILED SUB-BIDS

- A. MASONRY is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID
- B. All sub-bids shall be submitted on the FORM FOR FILE SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.
- C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated on the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.
- D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, "NOTICE TO ALL BIDDERS", and the attention of the sub-bidders is directed thereto.
- E. The work to be completed by the Filed Sub-Bidder for the work of this section as described herein and as shown on the following listed Drawings: D1-01 through A3-02, P0-01 through P2-01, H0-1 through H2-0, E0-01, E1-01, and FA0-01.

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.
- 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 Unit Masonry work required to complete the work of the contract including all the Unit Masonry work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Unit Masonry work with all the other trades for the project. Provide all demolition and disposal work to complete the Unit Masonry 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Unit Masonry work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Unit Masonry work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Concrete block.
 - b. Reinforcement and anchorage.
 - c. Lintels.
 - d. Mortar and grout.

1.03 RELATED REQUIREMENTS

- A. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel for grouted masonry.
- B. Section 05 50 00 - METAL FABRICATIONS: Loose steel lintels.
- C. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.04 REFERENCE STANDARDS

- A. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2009a (Reapproved 2014).
- B. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- C. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.
- D. ASTM C150/C150M - Standard Specification for Portland Cement; 2018.
- E. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2006 (Reapproved 2011).
- F. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.
- G. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2011.
- H. ASTM C476 - Standard Specification for Grout for Masonry; 2018.

- I. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2016.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all relevant installers.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- D. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
- E. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

1.07 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 2. Special Shapes: Provide non-standard blocks configured for corners, lintels, headers, and control joint edges.
 - a. Provide square-edged units for outside corners.
 - 3. Non-Loadbearing Units: ASTM C129.
 - a. Both hollow and solid block, as indicated.
 - b. Lightweight.
 - 4. Standard Units with Factory-Installed Insulation Inserts: ASTM C90, normal weight.

- a. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
- b. Insulation Type: Manufacturer's standard expanded polystyrene (XPS).
- c. Exposed Faces: Color and texture to be selected from manufacturer's full range.

2.02 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 04 05 11.
- B. Portland Cement: ASTM C150/C150M, Type I.
- C. Hydrated Lime: ASTM C207, Type S.
- D. Grout Aggregate: ASTM C404.
- E. Water: Clean and potable.
- F. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 1. Type: Type S.
 2. Color: Standard gray.

2.03 REINFORCEMENT AND ANCHORAGE

- A. Manufacturers:
 1. Blok-Lok Limited: www.blok-lok.com.
 2. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 3. WIRE-BOND www.wirebond.com/#sle.
 4. Approved Equal.
- B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- C. Single Wythe Joint Reinforcement: ASTM A951/A951M.
 1. Type: Truss or ladder.
 2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M, Class 3.
 3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

2.04 LINTELS

- A. Refer to Section 05 50 00 - METAL FABRICATIONS for loose steel lintels.

2.05 MORTAR AND GROUT MIXING

- A. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- B. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

- A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.

- C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- D. Remove excess mortar and mortar smears as work progresses.
- E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.
- F. Interlock intersections and external corners, except for units laid in stack bond.
- G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- I. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.
- J. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.
- K. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHER
MASONRY, AND CAVITY WALL MASONRY

- A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.
- B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place continuous joint reinforcement in first and second joint below top of walls.
- D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.
- E. Lap joint reinforcement ends minimum 6 inches.
- F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
- G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.
- H. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.07 LINTELS

- A. Install loose steel lintels over openings.

- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
 - 1. Openings to 42 inches: Place two, No. 3 reinforcing bars 1 inch from bottom web.
 - 2. Openings from 42 inches to 78 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
 - 3. Openings over 78 inches: Reinforce openings as detailed.
 - 4. Do not splice reinforcing bars.
 - 5. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
 - 6. Place and consolidate grout fill without displacing reinforcing.
 - 7. Allow masonry lintels to attain specified strength before removing temporary supports.
- C. Maintain minimum 8 inch bearing on each side of opening.

3.08 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.09 BUILT-IN WORK

- A. As work progresses, install built-in anchor bolts, plates, and fabricated door metal frames and other items to be built into the work and furnished under other sections.
- B. Install built-in items plumb, level, and true to line.

3.10 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
- D. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
- E. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.
- F. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.11 CUTTING AND FITTING

- A. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other sections of work to provide correct size, shape, and location.
- B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.12 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

DIVISION 05

METALS

SECTION 05 50 00

METAL FABRICATIONS

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.
- 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 Metal Fabrications work required to complete the work of the contract including all the Metal Fabrications work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Metal Fabrications work with all the other trades for the project. Provide all demolition and disposal work to complete the Metal Fabrications 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Metal Fabrications work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Metal Fabrications work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Loose steel lintels.

1.03 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Placement of metal fabrications in masonry.

1.04 REFERENCE STANDARDS

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2013.
- D. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.
- E. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; 2017.
- F. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer; 1999 (Ed. 2004).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

1.06 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified steel fabricator that is accredited by IAS AC172.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Steel Sections: ASTM A36/A36M.
- B. Slotted Channel Fittings: ASTM A1011/A1011M.
- C. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- D. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATED ITEMS

- A. Lintels: As detailed; galvanized finish.

2.03 FINISHES - STEEL

- A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- B. Prime Painting: One coat.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Take all required measurements at the building site. Check measurements, compare dimensions and other data with various trades installed adjoining work to assure proper coordination.

3.02 PREPARATION

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 WORKMANSHIP

- A. All work shall be executed by experienced mechanics and shall conform to details, be clean and straight with sharply defined profiles. Unless otherwise particularly noted, finished surfaces shall have smooth finish.
- B. Flanges shall be concealed where practicable. Thickness of metal and details of assembly and support shall be such as to provide ample strength and stiffness.
- C. All materials and workmanship under this Section shall be subject to inspection in the mill, shop or field by the Architect, or by qualified inspectors retained by the Owner. Inspection shall be without expense to the Owner. However, such inspection, wherever conducted, shall not relieve Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements.

3.04 INSTALLATION

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Furnish, fabricate, install and anchor all miscellaneous metal work as indicated on the Drawings and as specified herein. Install all supports and anchors for miscellaneous metal work.
- D. Obtain approval prior to site cutting or making adjustments not scheduled. Do not enlarge unfair holes by burning and forcing, but correct by reaming.
- E. Clean up site of all debris, tools and materials daily.

3.05 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

3.06 PROTECTION

- A. The Contractor is responsible for protecting the finish of all shop-finished items after coating during storage, delivery and installation.
- B. Touch-up scrapes, scratches and any other mar in the finish after installation as per the specification.
- C. If Architect determines that the finish has been damaged by the Contractor, beyond repair by touch-up, the entire item section shall be removed and taken back to the shop and re-finished as per the specification and at no additional cost to the Owner.

END OF SECTION

DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

SECTION 06 10 00

ROUGH CARPENTRY

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.
- 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 Rough Carpentry work required to complete the work of the contract including all the Rough Carpentry work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Rough Carpentry work with all the other trades for the project. Provide all demolition and disposal work to complete the Rough Carpentry 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Rough Carpentry work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Rough Carpentry work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. All General Contractor's temporary work, including barricades, tarpaulins, protective covers, dust barriers, scaffolding, and entrances.

3. Installation of materials supplied under other specification sections, including but not limited to: Blocking, electrical backer boards, and work by separate vendors under separate contract.
4. Miscellaneous wood framing, sheathing, and blocking required to complete the work.
5. Scope of Work: As follows and as indicated on the drawings.
 - a. Electrica; room mounting boards.
 - b. Concealed wood blocking, nailers, and supports.
 - c. Miscellaneous wood nailers, furring, and grounds.

1.03 RELATED REQUIREMENTS

- A. Section 06 20 00 - Finish Carpentry.
- B. Section 08 31 00 - Access Doors and Panels.
- C. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.
- D. Section 10 21 13.17 - Phenolic Toilet Compartments.
- E. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.
- F. Section 22 00 00 - Plumbing.
- G. Section 23 00 00 - HVAC.
- H. Section 26 00 00 - Electrical.

1.04 REFERENCE STANDARDS

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- B. AWPA U1 - Use Category System: User Specification for Treated Wood; 2017.
- C. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. PS 20 - American Softwood Lumber Standard; 2015.
- E. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17; 2015.
- F. WWPA G-5 - Western Lumber Grading Rules; 2017.

1.05 SUBMITTALS

- A. Within thirty (30) days after Notice to Proceed, submit complete materials data and Shop Drawings in full compliance with Section 01 30 00.
- B. Submit a complete list of all materials and products required to complete the work of this Section.
- C. Submit full Product Data of all manufactured or proprietary items, and certification of compliance with these requirements for all items to be furnished exactly as specified.

- D. Submit Shop Drawings of all items to be fabricated off or on site as requested by the Consultant or required for proper coordination of the work. Shop Drawings may include detailed framing plans and elevation, bracing or connection details, sheathing layouts, schedules or diagrams of openings, and other information.
- E. See Section 01 30 00 - Submittals, for submittal procedures.
- F. Product Data: Provide technical data on wood preservative materials and application instructions.
- G. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

- A. Softwood Lumber Standards: Provide lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's Board of Review.
- B. Plywood Standards: Provide plywood to comply with PS-1 "Voluntary Product Standard PS-1 for Structural Plywood," or PS-2 "Voluntary Product Standard PS-2 Performance Standard for Structural Panels." Products not manufactured under PS-1 or PS-2 provisions shall comply with APA - The Engineered Wood Association's (APA) proprietary standard PRP-108, "Performance Standards and Qualification Policy for Wood Structural Panels" and with ANSI A199.1.
- C. Grade Stamps: Each piece of lumber and plywood delivered to job site shall have factory-market grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species and moisture content at time of surfacing, and mill.
- D. Preservation treated lumber shall be marked according to AWPB Quality Mark Requirements, complying with AWPB LP-2.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.08 JOB CONDITIONING

- A. Time delivery and installations of carpentry work to avoid delaying other trades whose work is dependent on or affected by the carpentry work and to comply with protection and storage requirements.
- B. Contractor must examine the substrates and supporting structures and the conditions under which the carpentry work is to be installed, and notify the Owner in writing of conditions until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- C. Coordinate location of furring, nailers, blocking, grounds, and similar supports so that attached work will comply with design requirements.

1.09 WARRANTY

- A. See Section 01 70 00 - Project Closeout, for additional warranty requirements.
- B. Correct defective Work within a five (5) year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
 - 2. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
 - 3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.02 DIMENSION LUMBER

- A. Grading Agency: West Coast Lumber Inspection Bureau; WCLIB (GR).
- B. Grading Agency: Western Wood Products Association; WWPA G-5.
- C. Sizes: Nominal sizes as indicated on drawings, S4S.
- D. Moisture Content: S-dry or MC19.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
 - 1. Lumber: S4S, No. 2.
 - 2. Boards: S4S, No. 2.

2.03 FACTORY WOOD TREATMENT

- A. Treated Lumber and Plywood: Comply with requirements of AWWA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
 - 1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWWA standards.
- B. Preservative Treatment:
 - 1. Preservative Pressure Treatment of Lumber Above Grade: AWWA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
 - a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

- b. Treat lumber exposed to weather.
 - c. Treat lumber in contact with roofing, flashing, or waterproofing.
 - d. Treat lumber in contact with masonry or concrete.
 - e. Treat lumber less than 18 inches above grade.
2. Preservative Pressure Treatment of Plywood Above Grade: AWWA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative.
 - a. Kiln dry plywood after treatment to maximum moisture content of 19 percent.
 - b. Treat plywood in contact with masonry or concrete.
 - c. Treat plywood less than 18 inches above grade.

PART 3 EXECUTION

3.01 PREPARATION

- A. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.
- C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.
- E. Provide the following non-structural framing and blocking, including but not limited to:
 1. Cabinets and shelf supports.
 2. Wall brackets.
 3. Handrails.
 4. Grab bars.

5. Toilet and bath accessories.
6. Wall-mounted door stops.
7. Wall paneling and trim.

3.04 MISCELLANEOUS BLOCKING AND CARPENTRY

- A. Furring, blocking, and backing shall be furnished and installed where required for reception of wall board, formation of architectural features, concealment of pipes, conduits, ducts, attachment for supports for toilet room accessories, building specialties, and other fixtures. Contractor shall consult with the trades concerned and set furring and blocking they require.
- B. Dressed wood grounds shall be furnished and installed as indicated or as required for securing trim or other finish. Set grounds rigid, true, and in perfect alignment. Nail grounds to wood members, and secure to concrete or masonry with nailing blocks or plugs, or expansion type anchors. Provide wood stripping where indicated or required for the attachment of finish materials to wood, concrete, masonry, or other surfaces.

3.05 INTENT AND WORKMANSHIP

- A. It is not the intent of this Section to hereinafter define the types, sizes, or installation methods for each item of work. Methods of installation, joinery, sizes, spacing of nailers and furring strips, and other information pertaining to the lumber, plywood, and other items of required work, shall be installed in accordance with the details on the Drawings for the specified areas involved.
- B. Work that is to be finished or painted shall be free from defects or blemishes on surfaces exposed to view that will show after the finish coat of paint is applied. Any material which is in any way defective and not up to specifications for quality and grade for its intended use, or otherwise not in proper condition, shall be rejected.

3.06 INSTALLATION OF PANELS

- A. Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
 1. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 2. Install adjacent boards without gaps.

3.07 TOLERANCES

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.
- C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 CLEANING

- A. Waste Disposal:
 - 1. Comply with applicable regulations.
 - 2. Do not burn scrap on project site.
 - 3. Do not burn scraps that have been pressure treated.
 - 4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.
- B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.
- C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

ROUGH CARPENTRY
06 10 00 - 8

DIVISION 06

WOOD, PLASTICS, AND COMPOSITES

SECTION 06 20 00

FINISH CARPENTRY

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 Finish Carpentry work required to complete the work of the contract including all the Finish Carpentry 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 Finish Carpentry work with all the other trades for the project. Provide all demolition and disposal work to complete the Finish Carpentry 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. Finish Carpentry work includes, but is not limited to:
 - 1. Wood benches and floor metal mounted supports.
 - 2. Wood door frames, glazed frames.
 - 3. Doors, frames and hardware.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).

- B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

- A. Interior Woodwork Items:
 - 1. Wood benches as indicated on the drawings to match existing and floor metal supports to match existing..

2.02 WOOD-BASED COMPONENTS

- A. Wood fabricated from old growth timber is not permitted.

2.03 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.

2.04 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify building items affecting work of this section are placed and ready to receive this work.

3.02 INSTALLATION

- A. Set and secure materials and components in place, plumb and level.
- B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.03 PREPARATION FOR SITE FINISHING

- A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

LOWELL POLICE LOCKER ROOMS RENOVATIONS
CITY OF LOWELL
LOWELL, MASSACHUSETTS
CBI JOB NO.: CB190850

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

3.04 TOLERANCES

- A. Maximum Variation from True Position: 1/16 inch.
- B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 21 00

THERMAL INSULATION

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 Thermal Insulation work required to complete the work of the contract including all the Thermal Insulation 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 Thermal Insulation work with all the other trades for the project. Provide all demolition and disposal work to complete the Thermal Insulation 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.

1.03 SECTION INCLUDES

- A. Board insulation at the exterior concrete wall.

1.04 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies

1.05 REFERENCE STANDARDS

- A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2018.

- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.
- C. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 2016a.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. Insulation On the Existing Exterior Walls: Extruded polystyrene (XPS) board.
- B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

2.02 FOAM BOARD INSULATION MATERIALS

- A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
 - 1. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
 - 2. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
 - 3. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
 - 4. Manufacturers:
 - a. Dow Chemical Company; STYROFOAM HIGHLOAD 40:
www.dowbuildingsolutions.com/#sle.
 - b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
 - c. Or Approved Equal.

2.03 ACCESSORIES

- A. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

- B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT EXTERIOR WALL

- A. Install boards horizontally on the existing exterior wall.
- B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 PROTECTION

- A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 84 00

FIRESTOPPING

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.
- 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 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 reinforcing, pinning, and finishes. 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Work of this Section includes but is not limited to all Firestopping necessary, to perform the work of this contract.
- C. Firestopping work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Firestopping work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.

- a. Firestopping of joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.03 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry.
- B. Section 23 00 00 - HVAC
- C. Section 26 00 00 - Electrical.

1.04 REFERENCE STANDARDS

- A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2013a (Reapproved 2017).
- C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2015.
- D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops; 2014b.
- E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers; 2010a (Reapproved 2015).
- F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus; 2015b, with Editorial Revision (2016).
- G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies; 2013 (Reapproved 2017).
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.
- I. ITS (DIR) - Directory of Listed Products; current edition.
- J. FM (AG) - FM Approval Guide; current edition.
- K. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- L. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
- M. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
- N. UL (DIR) - Online Certifications Directory; Current Edition.
- O. UL (FRD) - Fire Resistance Directory; Current Edition.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
- C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
- D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.
- E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- F. Installer Qualification: Submit qualification statements for installing mechanics.

1.06 QUALITY ASSURANCE

- A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
 - 1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
 - 2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and:
 - 1. Trained by manufacturer.
 - 2. Verification of minimum three years documented experience installing work of this type.

1.07 FIELD CONDITIONS

- A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
- B. Provide ventilation in areas where solvent-cured materials are being installed.
- E. The General Contractor shall provide to the Architect written reports prepared by the Special Inspector of all reviews, inspections, and testing performed. Reports shall document compliance of the work, and identify remedial actions required.
- F. Any and all remedial work required by the Special Inspector to satisfy applicable code requirements shall be performed by the responsible Contractor without additional cost.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Firestopping Manufacturers:
 - 1. 3M Fire Protection Products: www.3m.com/firestop.
 - 2. Hilti, Inc: www.us.hilti.com/#sle.
 - 3. Specified Technologies Inc: www.stifirestop.com/#sle.
 - 4. Approved Equal.

2.02 MATERIALS

- A. Firestopping Materials: Any materials meeting requirements.
- B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
- C. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.
- D. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
- E. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING ASSEMBLY REQUIREMENTS

- A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - 2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 - 3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
 - 4. Where floor assembly is not required to have a fire rating, provide systems that have been tested to show L Rating as indicated.
- B. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
 - 1. Movement: Provide systems that have been tested to show movement capability as indicated.
- C. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

1. Movement: Provide systems that have been tested to show movement capability as indicated.
 - D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
 1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
 2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
- 2.04 FIRESTOPPING SYSTEMS
- A. Firestopping: Any material meeting requirements.
 1. Fire and Smoke Ratings: Use any system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.

3.03 INSTALLATION

- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by Special Inspector.
- C. Install labeling required by code.

3.04 FIELD QUALITY CONTROL

- A. Special Inspector: Independent inspection agency employed and paid by Owner, will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.
- B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

LOWELL POLICE LOCKER ROOM RENOVATIONS
CITY OF LOWELL
LOWELL MASSACHUSETTS
CBI JOB NO.: CB19085

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

3.06 PROTECTION

- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

DIVISION 07

THERMAL AND MOISTURE PROTECTION

SECTION 07 92 00

JOINT SEALANTS

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.
- 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 Joint Sealants work required to complete the work of the contract including all the Joint Sealants work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Joint Sealants work with all the other trades for the project. Provide all demolition and disposal work to complete the Joint Sealants 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Joint Sealants work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Joint Sealants work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Nonsag gunnable joint sealants.
 - b. Self-leveling pourable joint sealants.

JOINT SEALANTS

- c. Joint backings and accessories.
- d. Provide Silicone Sealant: at exterior window security screen system.
- e. Provide sealants at all interior finish trim joints, and between new or painted interior finishes.
- f. Provide sealants at the full perimeter of all openings and penetrations in interior.
- g. Provide sealants at all interior control and construction joints, and in joints between CMU and adjacent materials.
- h. Provide a complete watertight installation as per good construction practice.

1.03 RELATED REQUIREMENTS

- A. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.
- B. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.04 REFERENCE STANDARDS

- A. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2015a.
- B. ASTM C834 - Standard Specification for Latex Sealants; 2017.
- C. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.
- D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2008 (Reapproved 2012).
- G. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2002 (Reapproved 2013).
- H. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2013.
- I. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).
- J. SWRI (VAL) - SWR Institute Validated Products Directory; Current Edition.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
 - 1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.

2. List of backing materials approved for use with the specific product.
 3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
 4. Substrates the product should not be used on.
 5. Substrates for which use of primer is required.
 6. Substrates for which laboratory adhesion and/or compatibility testing is required.
 7. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
 8. Sample product warranty.
 9. Certification by manufacturer indicating that product complies with specification requirements.
 10. SWRI Validation: Provide currently available sealant product validations as listed by SWRI (VAL) for specified sealants.
- C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
- D. Color Cards for Initial Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
- E. Samples for Verification: Where custom sealant color is specified, obtain directions from Architect and submit at least two physical samples for verification of color of each required sealant.
- F. Mockup for Final Selection: Install in-place mockups of up to three (3) colors of each sealant type between each combination of substrates for final color selection by Architect. Each color shall be installed in the same manner as the finished joint sealant, to a minimum length of eighteen inches (18"). Mockups shall not be permitted to remain as part of the finished work.
- G. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.
- H. Installation Plan: Submit at least four weeks prior to start of installation.
- I. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.
- J. Field Quality Control Plan: Submit at least two weeks prior to start of installation.
- K. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

- L. Installation Log: Submit filled out log for each length or instance of sealant installed.
- M. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.06 QUALITY ASSURANCE

- A. Maintain one copy of each referenced document covering installation requirements on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.
- E. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
 - 1. Adhesion Testing: In accordance with ASTM C794.
 - 2. Compatibility Testing: In accordance with ASTM C1087.
 - 3. Stain Testing: In accordance with ASTM C1248; required only for stone substrates.
 - 4. Allow sufficient time for testing to avoid delaying the work.
 - 5. Deliver to manufacturer sufficient samples for testing.
 - 6. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
 - 7. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.
- F. Installation Plan: Include schedule of sealed joints, including the following.
 - 1. Joint width indicated in Contract Documents.
 - 2. Joint depth indicated in Contract Documents; to face of backing material at centerline of joint.
 - 3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgement that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.
 - 4. Approximate date of installation, for evaluation of thermal movement influence.

5. Installation Log Form: Include the following data fields, with known information filled out.
 - a. Unique identification of each length or instance of sealant installed.
 - b. Location on project.
 - c. Substrates.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Primer to be used, or indicate as "No primer" used.
 - g. Size and actual backing material used.
 - h. Date of installation.
 - i. Name of installer.
 - j. Actual joint width; provide space to indicate maximum and minimum width.
 - k. Actual joint depth to face of backing material at centerline of joint.
 - l. Air temperature.
- G. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.
 1. Identification of testing agency.
 2. Name(s) of sealant manufacturers' field representatives who will be observing
 3. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
 - a. Substrate; if more than one type of substrate is involved in a single joint, provide two entries on form, for testing each sealant substrate side separately.
 - b. Test date.
 - c. Location on project.
 - d. Sealant used.
 - e. Stated movement capability of sealant.
 - f. Test method used.
 - g. Date of installation of field sample to be tested.
 - h. Date of test.
 - i. Copy of test method documents.
 - j. Age of sealant upon date of testing.
 - k. Test results, modeled after the sample form in the test method document.
 - l. Indicate use of photographic record of test.
- H. Field Quality Control Plan:
 1. Visual inspection of entire length of sealant joints.
 2. Non-destructive field adhesion testing of sealant joints, except interior acrylic latex sealants.

- a. Test the entire length of every sealant joint.
 3. Destructive field adhesion testing of sealant joints, except interior acrylic latex sealant.
 - a. For each different sealant and substrate combination, allow for one test every 100 feet in the first 1000 linear feet, and one test per 1000 linear feet thereafter, or once per floor on each elevation.
 - b. If any failures occur in the first 1000 linear feet, continue testing at frequency of one test per 500 linear feet at no extra cost to Owner.
 4. Field testing agency's qualifications.
 5. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.
- I. Field Adhesion Test Procedures:
1. Allow sealants to fully cure as recommended by manufacturer before testing.
 2. Have a copy of the test method document available during tests.
 3. Take photographs or make video records of each test, with joint identification provided in the photos/videos; for example, provide small erasable whiteboard positioned next to joint.
 4. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
 5. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
 6. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Owner.
 7. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Architect.
- J. Non-Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Nondestructive Continuous Method.
1. Record results on Field Quality Control Log.
 2. Repair failed portions of joints.
- K. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.
1. Sample: At least 18 inch long.

2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.
 3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.
 4. Record results on Field Quality Control Log.
 5. Repair failed portions of joints.
- L. Field Adhesion Tests of Joints: Test for adhesion using most appropriate method in accordance with ASTM C1521, or other applicable method as recommended by manufacturer.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Correct defective work within a five year period after Date of Substantial Completion.
- C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

- A. Scope:
 1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between window security screen and adjacent existing construction.
 - b. Joints between door and other frames and adjacent construction.
 - c. Joints between different exposed materials.
 - d. Openings below ledge angles in masonry.
 - e. Other joints indicated below.
 2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
 - a. Joints between door, window, and other frames and adjacent construction.
 - b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.

JOINT SEALANTS

- 1) Exception: Through-penetrations in sound-rated assemblies that are also fire-rated assemblies.
- c. Other joints indicated below.
3. Do not seal the following types of joints.
 - a. Intentional weepholes in masonry.
 - b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
 - c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
 - d. Joints where installation of sealant is specified in another section.
 - e. Joints between suspended panel ceilings/grid and walls.
- B. Exterior Joints: Use nonsag non-staining silicone sealant, Type S-1, unless otherwise indicated.
- C. Interior Joints: Use nonsag polyurethane sealant, Type P-1, unless otherwise indicated.
 1. Type A-1 - Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
 2. Type P-2 - Floor Joints in Wet Areas: Non-sag polyurethane "traffic-grade" sealant suitable for continuous liquid immersion.
 3. Type S-4 - Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
- D. Interior Wet Areas: Bathrooms; fixtures in wet areas include plumbing fixtures.

2.02 JOINT SEALANTS - GENERAL

- A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.
- B. Primer Required: Install primer at all locations. Follow all manufacturer's instructions.
 1. Exception: Primer may be omitted at joints and substrates specifically noted in the manufacturer's written instructions as not requiring primer, following satisfactory demonstration of primerless adhesion in the field. Primerless adhesion shall be documented through a minimum of two (2) destructive field tests per joint and substrate type, prior to proceeding with additional installation.
- C. Colors: As selected by Architect from manufacturer's full range.
 1. Sealant color shall be selected based on color of the substrate.
 2. There shall be no limit to the number of sealant colors to be used within the work.

2.03 NONSAG JOINT SEALANTS

- A. Type S-1 - Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus 100 percent and minus 50 percent, minimum.
 2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
 3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
 4. Cure Type: Single-component, neutral moisture curing.
 5. Service Temperature Range: Minus 20 to 180 degrees F.
 6. Manufacturers:
 - a. Dow Chemical Company; DOWSIL 790 Silicone Building Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html/.
 - b. Pecora Corporation; Pecora 890 NST (Non-Staining Technology): www.pecora.com/.
 - c. Tremco Commercial Sealants & Waterproofing; Spectrem 1: www.tremcosealants.com/.
 - d. Approved Equal.
- B. Type S-4 - Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
1. Manufacturers:
 - a. Dow Chemical Company; DOWSIL 768 Sealant with Fungicide: consumer.dow.com/en-us/industry/ind-building-construction.html.
 - b. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
 - c. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.
 - d. Approved Equal.
- C. Type P-2 - Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
1. Movement Capability: Plus and minus 25 percent, minimum.
 2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
 3. Manufacturers:
 - a. Master Builders Solutions by BASF; MasterSeal CR 195: www.master-builders-solutions.basf.us.
 - b. Sika Corporation; Sikaflex-1a: www.usa-sika.com/#sle.

- c. Tremco Commercial Sealants & Waterproofing; Dymonic 100:
www.tremcosealants.com/#sle.
 - d. Approved Equal.
- D. Type A-1 - Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
- 1. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).
 - 2. Manufacturers:
 - a. Pecora Corporation; AC-20 +Silicone: www.pecora.com/#sle.
 - b. Sherwin-Williams Company; 950A Siliconized Acrylic Latex Caulk:
www.sherwin-williams.com/#sle.
 - c. Tremco Commercial Sealants & Waterproofing; Tremflex 834:
www.tremcosealants.com/#sle.
 - d. Approved Equal..

2.04 ACCESSORIES

- A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.
- 1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
 - 2. Open Cell: 40 to 50 percent larger in diameter than joint width.
 - 3. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.
 - 4. Manufacturers:
 - a. ADFAST Corporation: www.adfastcorp.com/.
 - b. Nomaco, Inc: www.nomaco.com/.
 - c. W.R. Meadows, Inc: www.wrmeadows.com/
 - d. Approved Equal.
- B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.
- C. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that joints are ready to receive work.
- B. Verify that backing materials are compatible with sealants.

- C. Verify that backer rods are of the correct size.
- D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan, no fewer than one (1) test per combination of substrates.
 - 1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
 - 2. Notify Architect of date and time that tests will be performed, at least 7 days in advance.
 - 3. Arrange for sealant manufacturer's technical representative to be present during tests.
 - 4. Record each test on Preinstallation Adhesion Test Log as indicated.
 - 5. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary (with Architect's approval) to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Architect.
 - 6. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.02 PREPARATION

- A. Remove loose materials and foreign matter that could impair adhesion of sealant.
- B. Clean joints, and prime per specification requirements, in accordance with manufacturer's instructions.
- C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
- D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable. Adjacent surfaces or contaminated by sealant shall be replaced by the Contractor at no additional cost to the Owner.
- E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

- A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Perform installation in accordance with ASTM C1193.
- C. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Measure joint dimensions and size joint backers to achieve the following, unless otherwise indicated in the Contract Documents or sealant manufacturer's written instructions:
 - 1. Width/depth ratio of 2:1.

2. Neck dimension no greater than 1/3 of the joint width.
 3. Surface bond area on each side not less than 75 percent of joint width.
- E. Take all steps to avoid three (3) sided adhesion:
1. Where backer rod is required it shall be installed using only blunt instruments or rounded tools which will ensure a uniform (+/- 1/8") depth without puncturing the material.
 2. Install bond breaker backing tape where backer rod cannot be used.
- F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
- G. Do not install sealant when ambient temperature or substrate temperatures are outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.
- H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.
1. All sealants shall be tooled in place.
 2. Use of additional materials, fluids, or solvents to aid in tooling of sealants is not acceptable, except where explicitly permitted by the sealant manufacturer in writing, and approved by the Architect.
- I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

- A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
- B. Non-Destructive Adhesion Testing: If there are any failures in first 100 linear feet, notify Architect immediately.
- C. Destructive Adhesion Testing: If there are any failures in first 1000 linear feet, notify Architect immediately.
- D. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.
- E. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

DIVISION 08

OPENINGS

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

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.
- 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 Hollow Metal Doors and Frames Work required to complete the Work of the Contract including all the Hollow Metal Doors and Frames Work shown on the plans, listed in the specification, and needed to install a complete assembly in every way. Coordinate the Hollow Metal Doors and Frames Work with all the other trades for the project. Provide all demolition and disposal Work to complete the Hollow Metal Doors and Frames 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. Hollow Metal Doors and Frames Work includes, but is not limited to:
 - 1. Provide and install factory-primed Hollow Metal Doors and Frames where scheduled on the Drawings.
 - 2. Coordinate and schedule work with Section 08 71 00 - Door Hardware.

1.03 SECTION INCLUDES

- A. Non-fire-rated hollow metal doors and frames.

HOLLOW METAL DOORS AND FRAMES

1.04 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry - Filed Sub-Bid
- B. Section 08 71 00 - Door Hardware.
- C. Section 08 80 00 - Glazing: Glass for doors and borrowed lites.

1.05 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames; 2007 (R2011).
- C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.
- D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2014.
- E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2017.
- G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2016.
- H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2017.
- I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.
- J. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; 2007.
- K. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.
- L. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.
- C. Samples: Submit two samples of metal, 2 inch by 2 inch in size showing factory finishes, colors, and surface texture.

- D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- E. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.
- F. Manufacturer's Qualification Statement.
- G. Installer's Qualification Statement.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years documented experience.
- B. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer: www.steeldoor.org/sdicertified.php/#sle.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- D. Maintain at project site copies of reference standards relating to installation of products specified.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS BASIS OF DESIGN

- A. Hollow Metal Doors and Frames:
 - 1. Ceco Door, an Assa Abloy Group company; (C) Steel - Stiffened - Medallion Series: www.assaabloydss.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

- A. Requirements for Hollow Metal Doors and Frames:
 - 1. Steel Sheet: Comply with one or more of the following requirements; galvanized steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
 - 2. Accessibility: Comply with ICC A117.1 and ADA Standards.
 - 3. Door Edge Profile: Manufacturers standard for application indicated.
 - 4. Typical Door Face Sheets: Flush.

- B. Hollow Metal Panels: Same construction, performance, and finish as doors.
- C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

- A. Interior Doors, Non-Fire-Rated:
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 - Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Model 1 - Full Flush.
 - d. Door Face Metal Thickness: 20 gage, 0.032 inch, minimum.
 - 2. Door Thickness: 1-3/4 inch, nominal.

2.04 HOLLOW METAL FRAMES

- A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.
- B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
 - 1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
 - 2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
- C. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.
- D. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
- E. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inch high to fill opening without cutting masonry units.

2.05 FINISHES

- A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.
- B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.
 - 1. Color: As selected by Architect from manufacturer's standard range.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

- A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.
- B. Install prefinished frames after painting and wall finishes are complete.
- C. Coordinate frame anchor placement with wall construction.
- D. Install door hardware as specified in Section 08 71 00.
- E. Touch up damaged factory finishes.

3.03 TOLERANCES

- A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

- A. Adjust for smooth and balanced door movement.

3.05 SCHEDULE

- A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

DIVISION 08

OPENINGS

SECTION 08 14 16

FLUSH WOOD DOORS

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.
- 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 Flush Wood Doors Work required to complete the Work of the Contract including all the Flush Wood Doors Work shown on the plans, listed in the specification, and needed to install a complete assembly in every way. Coordinate the Flush Wood Doors Work with all the other trades for the project. Provide all demolition and disposal Work to complete the Flush Wood Doors 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. Flush Wood Doors work includes, but is not limited to:
 - 1. Provide and install flush wood doors where scheduled on the Drawings.

1.03 SECTION INCLUDES

- A. Pre-Finished flush wood doors; flush and flush glazed configuration; non-rated.
- B. Refer to the Drawings for additional requirements.

1.04 RELATED REQUIREMENTS

- A. Section 08 11 13 - Hollow Metal Doors and Frames.
- B. Section 08 12 13 - Hollow Metal Frames.
- C. Section 08 71 00 - Door Hardware.
- D. Section 08 80 00 - Glazing.
- E. Section 09 21 16 - Gypsum Board Assemblies: Bullet-resistant sheathing and wallboard for bullet-resistant partitions and walls.
- F. Section 09 91 23 - Interior Painting - Filed Sub-Bid: Field finishing of doors.

1.05 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- C. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- E. ASTM E413 - Classification for Rating Sound Insulation; 2016.
- F. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2016).
- G. AWMAC (GIS) - Guarantee and Inspection Services Program; current edition at www.awmac.com/gis.php.
- H. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2016, with Errata (2017).
- I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. ITS (DIR) - Directory of Listed Products; current edition.
- K. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
- L. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.
- M. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.
- N. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.
- O. WI (CCP) - Certified Compliance Program (CCP); Current Edition.

1.06 SUBMITTALS

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics for each type specified. Include details of core and edge construction, louvers, trim for openings, and WDMA I.S.1-A classifications. Include factory finishing specifications.
- B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
 - 1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
 - 2. Include certification program label.
- C. Samples: Submit two samples of door construction, ___ 8 ___ by ___ 10 ___ inch in size cut from top corner of door.
- D. Samples: Submit two samples of door veneer, 8 by 10 inch in size illustrating wood grain, stain color, and sheen.
- E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.
- F. Warranty, executed in Owner's name.

1.07 QUALITY ASSURANCE

- A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
 - 1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
 - 2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
- C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.
- D. Quality Certification:
 - 1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
 - 2. Provide designated labels on shop drawings as required by certification program.

3. Provide designated labels on installed products as required by certification program.
4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
- D. Package pre-finished doors individually in plastic bags and wrap bundles of doors in plastic sheeting.
- E. Mark each door on top rail with opening number used on Shop Drawings.

1.09 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weather tight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction exceeding 0.01 inch in a 3-inch span.
- D. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Wood Veneer Faced Doors:
 1. Assa Abloy Wood Doors (GR): GPD Series
 2. Eggers Industries; (EG) Premium Series: www.eggersindustries.com.
 3. Or approved equal.
 4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 DOORS AND PANELS

- A. Doors: Refer to drawings for locations and additional requirements.
 - 1. Quality Standard: Premium Grade, Extra Heavy Duty performance, in accordance with WDMA I.S. 1A.
 - 2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated. Stiles and rails are bonded to core, then entire unit sanded before applying face veneers.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
 - 1. Provide solid core doors at each location.
 - 2. Smoke and Draft Control Doors (Indicated as "S" on Drawings): In addition to required fire rating, provide flush wood door assemblies in compliance with WDMA I.S. 1A requirements for "S" label; no additional gasketing or edge sealing allowed.
 - 3. Sound-Rated Doors: Minimum STC as indicated on drawings, calculated in accordance with ASTM E413, tested in accordance with ASTM E90.
 - 4. Bullet Resistant Doors: UL 752, Level 3.
 - 5. Wood veneer facing for field transparent finish.

2.03 DOOR AND PANEL CORES

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated. Wood fiber based materials complying with ANSI A208.1 Particleboard standard. Grade LD-2.
- B. Adhesive: Fully bonded construction using Polyurethane (PUR) glue.
- C. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve STC rating specified; plies and faces as indicated above.

2.04 DOOR FACINGS

- A. Veneer Facing for Transparent Finish: Natural birch, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.
 - 1. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

2.05 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 1213.

2.06 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.

- B. Cores Constructed with stiles and rails:
 - 1. Provide solid blocks at lock edge and top of door for closer for hardware reinforcement.
 - 2. Provide solid blocking for other throughbolted hardware.
- C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- D. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- E. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
- F. Provide edge clearances in accordance with the quality standard specified.
- G. Vertical Edges: Matching same species as faces. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
- H. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors

2.07 LIGHT FRAMES AND GLAZING

- A. Wood Beads for Light Openings in Wood Doors up to and including 20-minute rating:
 - 1. Wood Species: Same species as door faces.
 - 2. Profile:
 - a. M1 Flush Bead.

2.08 FACTORY FINISHING - WOOD VENEER DOORS

- A. Provide a clear protective coating over the wood veneer allowing the natural color and grain of the selected wood species to provide the appearance specified. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
 - 1. Transparent:
 - a. System - TR-8, UV Cured Acrylated Polyester/Urethane.
 - b. Sheen: Satin.
- B. Factory finish doors in accordance with approved sample.
- C. Finish faces, all four edges, edges of cutouts, and mortises.

2.09 ACCESSORIES

- A. Hollow Metal Door Frames: As specified in Section 08 12 13.
- B. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.

- C. Glazing: As specified in Section 08 80 00.
- D. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.
- E. Door Hardware: As specified in Section 08 71 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.
- C. Field-Finished Doors: Trimming to fit is acceptable.
 - 1. Adjust width of non-rated doors by cutting equally on both jamb edges.
 - 2. Trim maximum of 3/4 inch off bottom edges.
- D. Use machine tools to cut or drill for hardware.
- E. Coordinate installation of doors with installation of frames and hardware.
- F. Field modifications to doors shall not be permitted, except those specifically allowed by manufacturer or fire rating requirements.
- G. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.
- C. Finished Doors: Replace doors that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

DIVISION 08

OPENINGS

SECTION 08 31 00

ACCESS DOORS AND PANELS

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.
- 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 Access Doors and Panels work required to complete the work of the contract including all the Access Doors and Panels work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Access Doors and Panels work with all the other trades for the project. Provide all demolition and disposal work to complete the Access Doors and Panels 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Access Doors and Panels work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Access Doors and Panels work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Wall and ceiling mounted access units.

1.03 RELATED REQUIREMENTS

- A. Section 08 71 00 – Finish Hardware: Mortise cylinder and core hardware.
- B. Section 09 21 16 - Gypsum Board Assemblies.
- C. Section 09 91 23 - Interior Painting: Field paint finish.
- D. Section 22 00 00 - Plumbing: Plumbing components requiring access.
- E. Section 23 00 00 - HVAC: Mechanical components requiring access.
- F. Section 26 00 00 - Electrical: Electrical components requiring access.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Submittals, for submittal procedures.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of each access door and/or panel unit.
- D. Project Record Documents: Record actual locations of each access unit.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

- A. Wall-Mounted Units:
 - 1. Location: As indicated in the Drawings and Specifications.
 - 2. Panel Material: Steel, hot-dipped zinc, or zinc-aluminum-alloy coated.
 - 3. Size: 12 inch by 12 inch.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle. Door shall have rolled or turned-in edges.
 - 5. Wall Mounting Criteria: Provide surface-mounted face frame and door surface flush with frame surface.
- B. Ceiling-Mounted Units with Return Air Grille:
 - 1. Location: As indicated in the Drawings and Specifications.
 - 2. Panel Material: Aluminum extrusion with gypsum board inlay.
 - 3. Size - Other Ceilings: 12 inch by 12 inch.
 - 4. Door/Panel: Hinged, standard duty, with tool-operated spring or cam lock and no handle.

2.02 WALL AND CEILING MOUNTED ACCESS UNITS

- A. Manufacturers:
 - 1. ACUDOR Products Inc: www.acudor.com/#sle.
 - 2. Babcock-Davis: www.babcockdavis.com/#sle.
 - 3. Cendrex, Inc: www.cendrex.com/#sle.
 - 4. Nystrom, Inc: www.nystrom.com/#sle.
 - 5. Approved Equal.
- B. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.
 - 1. Style: Exposed frame with door surface flush with frame surface.
 - 2. Door Style: Single thickness with rolled or turned in edges.
 - 3. Frames: 3/16 inch galvanized steel angle.
 - 4. Hardware: Doors prepared to receive cylinders.
 - a. Hinges for Non-Fire-Rated Units: Continuous piano hinge. Heavy duty.
 - b. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.
- B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to proceeding with this work.
- B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 INSTALLATION

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings, and secure units rigidly in place.
- C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

DIVISION 08

OPENINGS

SECTION 08 56 56

SECURITY WINDOW SCREEN

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.
- 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 Security Screen work required to complete the work of the contract including all the Security Screen work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Security Screen work with all the other trades for the project. Provide all demolition and disposal work to complete the Security Screen 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Security Screen includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Security Screen work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.

1.03 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants.

1.04 SUBMITTALS

- A. See Section 01 30 00 - Submittals, for submittal procedures.
- B. Contractor shall submit shop drawings, showing details of attachment to surround materials and elevations showing scope of the project.
- C. Samples of materials may be requested without cost to owner: frame sections, infill sections, fasteners, mullion section, corner section, etc.
- D. Applicator's Qualification Statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five (5) years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1. Minimum five (5) years of documented experience.
 - 2. Approved by manufacturer.

1.06 WARRANTY

- A. The operation of the security screen supplied on the designated project shall be warranted for one (1) year against any proven defective material or parts, as called for in the specifications and approved shop drawings.

PART 2 PRODUCTS

2.01 MAIN FRAME

- A. The main frame shall be of channel design measuring 1.25"[31.75mm] x 2.875"[73.025mm] x 0.75"[19.05mm], extruded from 6063-T6-aluminum alloy. Weight shall be not less than .927 lbs./ft., with a nominal thickness of .125-inch. The corners of the main frame shall be mitered and internally robotically welded.
- B. A removable interlocking concealment cover (Z-shaped) measuring 2.094"[53.181] x 0.50"[12.70] x 0.625"[15.875], extruded from 6063-T6 aluminum alloy, .062-inch thick, .290 lbs./ft., shall be attached to the main frame using TORX® tamper-resistant screws. Braces shall be furnished when required.

2.02 SUB-FRAME

- A. The sub-frame shall be of channel design, extruded from 6063-T6-aluminum alloy. Weight shall be .515 lbs./ft. Wall thickness shall be .090-inch. The corners of the sub-frame shall be mitered, secured by an internal tension coupling assembly and shall be resistant to both torsion and flexural failure.

- B. The sub-frame shall have a continuous groove retaining a combination cushioning strip/insect shield.

2.03 FINISH

- A. The aluminum shall be thoroughly cleaned in a 5-step bonderizing process. An electrostatically applied thermoplastic, polyester powder coating (2.5 mil min. thickness) which shall be applied and baked to a hard mar-resistant finish in one of Kane's standard colors.

2.04 WIRE CLOTH

- A. Wire cloth shall be woven 10-mesh to the inch from .047-inch diameter Type 304 stainless steel wire and double crimped.

2.05 INFILL ATTACHMENT

- A. The wire cloth shall be folded 90 degrees and held securely in place by means of a removable interlocking concealment plate and TORX® tamper-resistant screws.
- B. The perforated panel shall lie flat on the main frame and be held in place by means of a removable interlocking concealment plate and TORX® tamper-resistant screws.
- C. TORX® tamper-resistant screws shall penetrate the removable interlocking concealment plate, wire cloth and main frame approximately 4" [101.6] on center.

2.06 LOCKS AND RELEASES

- A. Each screen shall have a concealed actuating ball bearing, 1/2" [12.7] diameter casehardened steel bolts. The bolts shall operate simultaneously from one key station with a special Bitt key.

Type 107N (four tumbler)

2.07 HARDWARE

- A. Each screen shall be provided with two or more concealed 13-gauge, electroplated steel hinges with 1/4" [6.35] diameter hardened, loose stainless steel pins and integral compression guards. 13-gauge stainless steel hinge available.
- B. Each screen shall include adjustment screws (1/4-20 x 3/4" Philips pan head thread cutting fastener) and .062-inch thick aluminum scribes. The 1-3/16" [30.1625] x 3/4" [19.05] scribes shall be supplied at the head and jambs if required.
- C. Each screen shall come fully assembled and tested at the factory for operation.

2.08 Frame Anchors: Mild steel plates, shapes, or bars, concealed in completed construction; provide anchorage devices as necessary to securely fasten security screen system to adjacent construction; use security fasteners for exposed anchors.

- A. For Embedding in Concrete: Threaded or wedge type anchor inserts, hot-dipped galvanized; ASTM A47/A47M malleable iron castings or ASTM A27/A27M cast steel; with hot-dip galvanized bolts welded to back of window frame, washers,

and shims as required; capable of sustaining four times the load imposed, substantiated by testing in accordance with ASTM E488/E488M

- 2.09 Basis of Design Product Kane Innovations, Erie, PA. www.kanneinnovations.com;
Aluminum Van-Guard Security System, Model: A-VNG-0
- 2.10 ACCEPTABLE MANUFACTURERS
- A. Avant Guards Manufacturing, Brooklyn, NY., www.avantguards.com
 - B. Kenco Wire and Iron Products Inc., Keansburg, NJ., www.kencowire.com
 - C. Approved Equal

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that openings fit allowable tolerances, are plumb, level, provide a solid anchoring surface and comply with approved shop drawings.

3.02 INSTALLATION

- A. Apply in accordance with manufacturer's instructions.
- B. Install in accordance with approved shop drawings and specifications.
- C. Plumb and align faces in a single plane and erect screens square and true, adequately anchored to structure.
- D. After completion of installation, screens shall be adjusted, in working order, and cleaned.

END OF SECTION

DIVISION 08

GENERAL REQUIREMENTS

SECTION 08 71 00

FINISH HARDWARE

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.
- 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 Finish Hardware work required to complete the work of the contract including all the Finish Hardware work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Finish Hardware work with all the other trades for the project. Provide all demolition and disposal work to complete the Finish Hardware 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Finish Hardware work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Finish Hardware work, including all items incidental thereto as specified herein and as shown on the Drawings.
- C. Related Divisions:
 - 1. Division 03 Concrete
 - 2. Division 06 Rough & Finish Carpentry
 - 3. Division 09 Finishes

FINISH HARDWARE

4. Division 26 Electrical
5. Division 28 Electronic Safety And Security

1.03 REFERENCES

- A. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI):
 1. ANSI/BHMA A156.1 Butts & Hinges (2016)
 2. ANSI/BHMA A156.2 Bored & Preassembled Locks & Latches (2011)
 3. ANSI/BHMA A156.4 Door Controls – Closers (2013)
 4. ANSI/BHMA A156.5 Cylinders and Input Devices for Locks (2014)
 5. ANSI/BHMA A156.6 Architectural Door Trim (2015)
 6. ANSI/BHMA A156.7 Template Hinge Dimensions (2016)
 7. ANSI/BHMA A156.13 Mortise Locks & Latches (2012)
 8. ANSI/BHMA A156.18 Materials & Finishes (2016)
 9. ANSI/BHMA A156.22 Door Gasketing Systems (2012)
 10. ANSI/BHMA A156.28 Keying Systems (2013)
 11. ANSI/BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames (2016)
- B. International Code Council/American National Standards Institute (ICC/ANSI)/ADA:
 1. ICC/ANSI A117.1 Standards for Accessible and Usable Buildings and Facilities 2017.
- C. Underwriters Laboratories, Inc. (UL):
 1. UL 10C Positive Pressure Fire Test of Door Assemblies.
 2. UL 1784 Air Leakage Test of Door Assemblies.
- D. Door and Hardware Institute (DHI):
 1. DHI Publications – Keying Systems and Nomenclature (1989).
 2. DHI Publication – Abbreviations and Symbols.
 3. DHI Publication – Installation Guide for Doors and Hardware.
 4. DHI Publication – Sequence and Format of Hardware Schedule (1996).
- E. National Fire Protection Agency (NFPA):
 1. NFPA 70 National Electrical Code 2017.
 2. NFPA 80 Standard for Fire Doors and Other Opening Protectives 2016.
 3. NFPA 101 Life Safety Code 2018.

1.04 SUBMITTALS

- A. Submit in accordance with Conditions of the Contract and Division 1 Administrative Requirements and Submittal Procedures Section.

B. Shop Drawings:

1. Organize hardware schedule in vertical format as illustrated in DHI Publications Sequence and Formatting for the Hardware Schedule. Include abbreviations and symbols page according to DHI Publications Abbreviations and Symbols. Complete nomenclature of items required for each door opening as indicated.
2. Coordinate final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of hardware.
3. Architectural Hardware Consultant (AHC), as certified by DHI, who will affix seal attesting to completeness and correctness, including the review of the hardware schedule prior to submittal.

C. Submit manufacturer's catalog sheet on design, grade, and function of items listed in hardware schedule. Identify specific hardware item per sheet, provide an index, and cover sheet.

D. Templates:

1. Upon final approval of the architectural hardware schedules, submit one set of complete templates for each hardware item to the door manufacturers, frame manufacturers, and the installers. Date and index these 8-1/2 inch x 11 inch papers in a three ring binder, including detailed lists of the hardware location requirements for mortised and surface applied hardware within fourteen days of receiving approved door hardware submittals.

E. Electrified Hardware: Provide electrical information to include voltage and amperage requirements for electrified door hardware and description of operation.

1. Description of operation for each electrified opening to include description of component functions including location, sequence of operation and interface with other building control systems.
2. Wiring Diagrams: Detail wiring for power, signal, and control system and differentiate between manufacturers installed and field-installed wiring. Include the following:
 - a. System schematic.
 - b. Point to point wiring diagram.
 - c. Riser diagram.
 - d. Elevation of each door.
3. Detail interface between electrified door hardware and fire alarm, access control, security, and building control systems.
4. Provide junction boxes, relays and terminal blocks as needed for proper door operations and connections.

F. Upon door hardware submittal approval, furnish for each electrified opening, three copies of point to point diagrams.

G. Closeout Submittals: Submit to Owner in a three-ring binder or CD if requested.

1. Warranties.
2. Maintenance and operating manual.
3. Maintenance service agreement.
4. Record documents.
5. Copy of approved hardware schedule.
6. Copy of approved keying schedule with bitting list.
7. Door hardware supplier name, phone number, and fax number.

1.05 QUALITY ASSURANCE

- A. Listed and Labeled electrified door hardware as defined in NFPA 70, Article 100, by a testing agency acceptable to authority having jurisdiction.
- B. Hardware supplier will employ an Architectural Hardware Consultant (AHC) as certified by DHI and a member of the seal program who will be available at reasonable times during course of work for Project hardware consultation.
1. Electrified Door Hardware Supplier Qualifications: Experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Door hardware conforming to ICC/ANSI A117.1: Handles pulls, latches locks and operating devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
- D. Fire Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and/or labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL 10C, unless otherwise indicated.
- E. Fire Door Inspection: Prior to receiving certificate of occupancy have fire rated doors inspected by an independent Certified Fire and Egress Door Assembly Inspector (FDAI), as certified by Intertek (ITS), a written report be submitted to Owner and Contractor. Doors failing inspection must be adjusted, replaced or modified to be within appropriate code requirements.
- F. Smoke and Draft Control Door Assemblies: Where smoke and draft control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
- G. Door hardware certified to ANSI/BHMA standards as noted, participate and be listed in BHMA Certified Products Directory.

- H. Substitution request: create a comparison chart that includes the testing information as well as the warranty for both the specified product and the proposed substitution. Include the reason for requesting the substitution, clear catalog copy highlighting the proposed product and options, compliance statement, technical data, product warranty and lead time, to show how the proposed can meet or exceed established level of design, function, and quality. Approval of request is at the discretion of the owner, architect, and their designated consultants and will be addressed via addendum prior to bid date.
- I. Meetings: Comply with requirements in Division 1 Section “Project Meetings.”
1. Low-voltage Coordination Meeting
 - a. Prior to furnishing door hardware submittals, convene a low-voltage coordination meeting. Participants required to attend: Contractor, installer, material supplier, manufacturer representatives, electrical contractor, security consultant, and fire alarm consultant.
 - b. Review sequence of operation for each opening with electrified hardware to ensure that every opening functions in the proper manner for the Owner’s use.
 - c. Discuss the types of electrified door hardware, inspection, and electrical roughing-in and other preparatory work performed by other trades.
 - d. Verify wire quantities, wire types, wire sizes, conduit sizes, and locations including if the power supplies will be centrally located or if they will be located near each opening.
 - e. Coordinate the door hardware, power supplies, back-up power requirements, access control components, fire alarm interfaces, elevator controls, and related building systems have all proper and necessary components to interface and operate correctly.
 2. Keying Meeting
 - a. Within fourteen days of receipt of approved door hardware submittals, contact Owner with representative from hardware supplier to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock. Provide keying system per Owner’s instructions.
 3. Pre-installation Meeting
 - a. Convene meeting within fourteen days of receipt of approved door hardware submittals. Participants required to attend: Contractor, installer, material supplier, manufacturer representatives, electrical contractor, security consultant and fire alarm consultant.
 - b. Include in-conference decisions regarding proper installation methods and procedures for receiving and handling hardware.
 - c. Review all system, elevation, and point-to-point drawings to ensure that all necessary components are provided and detailed.
 - d. Review and finalize construction schedule and verify availability of materials, installer’s personnel, equipment and facilities needed to make progress and avoid delays.

- J. Installer Qualifications: Specialized in performing installation of this Section and have five years minimum documented experience.
 - 1. Electrified Door Hardware Supplier Qualifications: Experienced door hardware installer who has installed projects with electrified door hardware similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- K. Hardware listed in 3.07 – Hardware Schedule is intended to establish minimum level of design, type, function and grade of hardware to be used.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Provide clean, dry and secure room for hardware delivered to Project but not yet installed. Shelve hardware off of the floor and with larger items of hardware being stored on wooden pallets. Arrange locksets and keyed cylinders by opening number. Organize the balance of hardware by brand, model of hardware, and hardware set number. Leave the door markings of the hardware visible for installers.
- B. Furnish hardware that is not bulk packed with each unit marked and numbered in accordance with approved finish hardware schedule. Include architect's opening number, hardware set number, and item number for each type of hardware. Include keyset symbols and corresponding hardware component for keyed products.
- C. Pack each item complete with necessary parts and fasteners in manufacturer's original packaging.
- D. Deliver architectural hardware to the job site according to the phasing agreed upon in the pre-installation meeting. Inventory the delivery with the supplier's assistance. Immediately note shortages and damages on the shipping receipts and bill of ladings. Coordinate replacement or repair with the supplier.
- E. Deliver permanent keys, cores and related accessories directly to Owner via registered mail or overnight package service. Establish the instructions for delivery to Owner at "Keying Conference."
- F. Waste Management and Disposal: Separate waste materials for use or recycling in accordance with Division 1.

1.07 WARRANTY

- A. General Warranty: Owner may have under provisions of the Contract Documents and be an addition and run concurrently with other warranties made by Contractor under requirements of the Contract documents.

- B. Special Warranty: Warranties specified in this article will not deprive Owner of other rights.
 - 1. Ten years for manual door closers.
 - 2. Five years for mortise, auxiliary and bored locks.
 - 3. Five years for exit devices.
 - 4. One year for electromechanical door hardware.
- C. Replace or repair defective products during warranty period in accordance with manufacturer's warranty at no cost to Owner. There is no warranty against defects due to improper installation, abuse, and failure to exercise normal maintenance.
- D. Maintenance Tool and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, removal and replacement of door hardware.

PART 2 – PRODUCTS

2.01 HINGES

- A. Hinges, electric hinges, and self-closing hinges of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Products to be certified and listed by the following:
 - 1. Butts and Hinges: ANSI/BHMA A156.1.
 - 2. Template Hinge Dimensions: ANSI/BHMA A156.7.
 - 3. Self-Closing Hinges: ANSI/BHMA A156.17.
- C. Butt Hinges:
 - 1. Hinge weight and size unless otherwise indicated in hardware sets:
 - a. Doors up to 36" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .134" and a minimum of 4-1/2" in height.
 - b. Doors from 36" wide up to 42" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .145" and a minimum of 4-1/2" in height.
 - c. For doors from 42" wide up to 48" wide and up to 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
 - d. Doors greater than 1-3/4" thick provide hinges with a minimum thickness of .180" and a minimum of 5" in height.
 - e. Width of hinge is to be minimum required to clear surrounding trim.
 - 2. Base material unless otherwise indicated in hardware sets:
 - a. Exterior Doors: 304 Stainless Steel, Brass or Bronze material.
 - b. Interior Doors: Steel material.
 - c. Fire Rated Doors: Steel or 304 Stainless Steel materials.
 - d. Stainless Steel ball bearing hinges to have stainless steel ball bearings. Steel ball bearings are unacceptable.
 - 3. Quantity of hinges per door unless otherwise stated in hardware sets:

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- a. Doors up to 60" in height provide 2 hinges.
 - b. Doors 60" up to 90" in height provide 3 hinges.
 - c. Doors 90" up to 120" in height provide 4 hinges.
 - d. Doors over 120" in height add 1 additional hinge per each additional 30" in height.
 - e. Dutch doors provide 4 hinges.
4. Hinge design and options unless otherwise indicated in hardware sets:
- a. Hinges are to be of a square corner five-knuckle design, flat button tips and have ball bearings unless otherwise indicated in hardware sets.
 - b. Out-swinging exterior and out-swinging access controlled doors are required to have Non-Removable Pins (NRP) to prevent removal of pin while door is in closed position.
 - c. When full width of opening is required, use hinges that are designed to swing door completely from opening when door is opened to 95 degrees.
 - d. When shims are necessary to correct frame or door irregularities, provide metal shims only.
5. Acceptable Manufacturers:
- | | |
|----------|-----------------|
| | Standard Weight |
| Hager | BB1279/BB1191 |
| Bommer | BB5000/BB5002 |
| McKinney | TA2714/TA2314 |

2.02 ELECTRIC STRIKES (Mortise and Cylindrical)

- A. Provide for use with type of locks shown on hardware schedule.
- B. Products to be certified and listed by the following:
1. ANSI/BHMA A156.31 Electric Strikes and Frame Mounted Actuators Grade 1.
 2. UL Tested 1500 lb. static strength.
 3. UL listed for Fire Doors and Frames where applicable.
 4. UL 1034 Burglary Resistance.
 5. UL 10C.3H fire-rated, 4' x 8' door.
- C. Material and Design:
1. To accept up to 3/4" latch bolt and 1" deadbolt.
 2. Field reversible, Fail Safe or Fail Secure.
 3. Dual voltage 12/24 VDC.
 4. Tamper resistant, stainless steel corrosion resistance parts, and cast body and keeper.

D. Acceptable Manufacturers:

Hager	2930 Series
SDC	55 Series
RCI	

2.03 LOCKS AND LATCHES

A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards: Product to be certified and listed by following:

1. ANSI/BHMA A156.2 Series 4000 Certified to Grade 1.
2. UL/cUL Labeled and listed for functions up to 3 hours for single doors up to 48" in width and up to 96" in height.
3. UL10C/UBC 7-2 Positive Pressure Rated.
4. ICC/ANSI A1117.1

C. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.

D. Material and Design:

1. Lock and latch chassis to be zinc dichromate for corrosion resistance.
2. Keyed functions to be of a freewheeling design to help resist against vandalism.
3. Non-handed, field reversible.
4. Thru-bolt mounting with no exposed screws.
5. Levers, zinc cast and plated to match finished designation in hardware sets.
6. Roses, wrought brass or stainless steel material.

E. Latch and Strike:

1. Stainless Steel latch bolt with minimum of 1/2" throw and deadlocking for keyed and exterior functions. Provide 3/4" latch bolt for pairs of fire-rated doors where required by door manufacturer. Standard backset to be 2-3/4" and adjustable faceplate to accommodate a square edge door or a standard 1/8" beveled edge door.
2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.

F. Options:

1. Doors requiring lead line protection – provide locks with 1/16" lead applied to lock and 1/16" lead wrapped around latch bolt.
2. Provide knurled levers on entry side of doors that are potentially dangerous to visually impaired persons.

G. Acceptable manufacturers:

Hager	3400 Series
Schlage	ND Series
Best	9K Series

2.04 LOCKS AND LATCHES

- A. Locks and latches of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Standards: Product to be certified and listed by following:
1. ANSI/BHMA A156.13 Series 1000 Certified to Grade 1 for Operational and Security.
 2. UL/cUL Labeled and listed up to 3 hours for single doors up to 48" in width and up to 96" in height.
 3. UL10C/UBC 7-2 Positive Pressure Rated.
 4. ICC/ANSI A117.1.
- C. Lock and latch function numbers and descriptions of manufacturer's series as listed in hardware sets.
- D. Material and Design:
1. Lock cases from fully wrapped, 12 gauge steel, zinc dichromate for corrosion resistance.
 2. Non-handed, field reversible without opening lock case.
 3. Break-away spindles to prevent unlocking during forced entry or vandalism.
 4. Levers, zinc cast, forged brass or stainless steel and plated to match finish designation in hardware sets.
 5. Sectional Roses, solid brass or stainless steel material and have a minimum diameter of 2-7/16".
 6. Armor fronts, self-adjusting to accommodate a square edge door or a standard 1/8" beveled edge door.
- E. Latch and Strike:
1. Stainless steel latch bolt with minimum of 3/4" throw and deadlocking for keyed and exterior functions.
 2. Strike is to fit a standard ANSI A115 prep measuring 1-1/4" x 4-7/8" with proper lip length to protect surrounding trim.
 3. Deadbolts to be 1-3/4" total length with a minimum of a 1" throw and 3/4" internal engagement when fully extended and made of stainless steel material.
- F. Options:
- G. Acceptable Manufacturers:
- | | |
|-------|-------------|
| Hager | 3800 Series |
|-------|-------------|

Best
Sargent

45H Series
8200 Series

2.05 CYLINDERS AND KEYING

- A. Cylinders of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Products to be certified and listed by the following:
 - 1. Auxiliary Locks: ANSI/BHMA A156.5
- C. Cylinders:
 - 1. Provide cylinders matched to the types required for hardware that has a locking function and for keyed electronic functions. Furnish with appropriate collars, cams, and tailpieces to fit and operate associated hardware. Stacking collars is not acceptable, a single collar of proper size is required.
 - 2. Manufacturer's standard tumbler type six-pin conventional cylinder.
- D. Keying:
 - 1. Keying by others into Owner's existing key system.
- E. Acceptable Manufacturers:
Schlage

2.06 CLOSERS

- A. Closers of one manufacturer as listed for continuity of design and consideration of warranty. Unless otherwise indicated on hardware schedule, comply with manufacturer's recommendations for size of closer, depending on width of door, frequency of use, atmospheric pressure, ADAAG requirements, and fire rating.
- B. Standards: Manufacturer to be certified by the following:
 - 1. BHMA Certified ANSI A156.4 Grade 1.
 - 2. ADA Complaint ANSI A117.1.
 - 3. UL/cUL Listed up to 3 hours.
 - 4. UL10C Positive Pressure Rated.
 - 5. UL10B Neutral Pressure Rated.
- C. Material and Design:
 - 1. Provide aluminum non-handed bodies with full plastic covers.

2. Closers will have separate staked adjustable valve screws for latch speed, sweep speed, and backcheck.
3. Provide Tri-Pack arms and brackets for regular arm, top jamb, and parallel arm mounting.
4. Double heat-treated steel, tempered springs.
5. Precision machined heat-treated steel piston.
6. Triple heat-treated steel spindle.
7. Full rack and pinion operation.

D. Mounting:

1. Out-swing doors surface parallel arm mount closers except where noted on hardware schedule.
2. In-swing doors surface regular arm mount closers except where noted on hardware schedule.
3. Provide brackets and shoe supports for aluminum doors and frames to mount fifth screw.
4. Furnish drop plates where top rail conditions on door do not allow for mounting of closer and where backside of closer is exposed through glass.

E. Size closers in compliance with requirements for accessibility (ADAAG). Comply with following maximum opening force requirements.

1. Interior hinged openings: 5.0 lbs.
2. Fire-rated and exterior openings are to be adjusted to have minimum opening force allowable by authority having jurisdiction.

F. Fasteners: Provide self-reaming, self-tapping wood and machine screws, and sex nuts and bolts for each closer.

G. Acceptable manufacturers:

Hager	5200 Series
Norton	8000 Series
Sargent	1330 Series

2.07 PROTECTIVE TRIM

A. Protective trim of one manufacturer as listed for continuity of design and consideration of warranty.

B. Size of protection plate: single doors, size two inches less door width (LDW) on push side of door, and one inch less door width on pull side of door. For pairs of doors, size one inch less door width (LDW) on push side of door, and 1/2 inch on pull side of door. Adjust sizes to accommodate accompanying hardware, such as, edge guards, astragals and others.

1. Kick Plates 10" high or sized to door bottom rail height.
2. Mop Plates 4" high.
3. Armor Plates 36" high.

C. Products to be certified and listed by the following:

1. Architectural Door Trim: ANSI/BHMA A156.6.
2. UL.

D. Material and Design:

1. 0.050" gage stainless steel.
2. Corners square, polishing lines or dominant direction of surface pattern so they run across door width of plate.
3. Bevel top, bottom, and sides uniformly leaving no sharp edges.
4. Countersink holes for screws. Space screw holes so they are no more than eight inches CTC, along a centerline not over 1/2" in from edge around plate. End screws maximum of 0.53" from corners.

E. UL label stamp required on protection plates when top of plate is more than 16 inches above bottom of door on fire rated openings. Verify door manufacturer's UL listing for maximum height and width of protection plate to be used.

F. Acceptable Manufacturers:

Hager	190S
Trimco	
Burns	

2.08 STOPS AND HOLDERS

A. Stops and holders of one manufacturer as listed for continuity of design and consideration of warranty.

B. Floor Stops: Provide door stops wherever necessary to prevent door or hardware from striking an adjacent partition or obstruction. Door stops and holders mounted in concrete floor or masonry walls have stainless steel machine screws and lead expansion shields.

C. Products to be certified and listed by the following:

1. Auxiliary Hardware: ANSI/BHMA A156.16.

D. Acceptable Manufacturers:

	Floor Mounted
Hager	241F/243F
Rockwood	
Burns	

2.09 FAIL-SAFE OR FAIL-SECURE LOCKING DEVICE POWER SUPPLIES

- A. Power supplies of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Products to be certified and listed by the following:
 - 1. UL Listed.
- C. Design:
 - 1. Interface with building alarm controls, card readers, keypads, and other door controls.
 - 2. Filtered and regulated 24 VDC constant voltage.
 - 3. 2 AMP load capacity.
 - 4. Over-voltage/short circuit protection.
 - 5. Surge protection for locking devices.
 - 6. Interface relay.
 - 7. Adjustable time delay.
- D. Acceptable Manufacturer:
Hager 2903

2.10 DOOR GASKETING AND WEATHERSTRIP

- A. Door gasketing and weatherstrip of one manufacturer as listed for continuity of design and consideration of warranty.
- B. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing where indicated on hardware schedule. Provide noncorrosive fasteners for exterior applications.
 - 1. Perimeter gasketing: Apply to head and jamb, forming seal between door and frame.
 - 2. Meeting stile gasketing: Fasten to meeting stiles, forming seal when doors are in closed position.
 - 3. Door bottoms: Apply to bottom of door, forming seal with threshold or floor when door is in closed position.
 - 4. Sound Gasketing: Cutting or notching for stop mounted hardware not permitted.
 - 5. Drip Guard: Apply to exterior face of frame header. Lip length to extend 4" beyond width of door.
- C. Products to be certified and listed by the following:
 - 1. Door Gasketing and Edge Seal Systems: ANSI/BHMA A156.22.
 - 2. BHMA certified for door sweeps, automatic door bottoms, and adhesive applied gasketing.

- D. Smoke-Labeled Gasketing: Comply with NFPA 105 listed, labeled, and acceptable to Authorities Having Jurisdiction, for smoke control indicated.
 - 1. Provide smoke-labeled gasketing on 20 minute rated doors and on smoke rated doors.
- E. Fire-Rated Gasketing: Comply with NFPA 80 listed, labeled, and acceptable to Authorities Having Jurisdiction, for fire ratings indicated.
- F. Refer to Section 08 1416 Wood Doors for Category A or Category B. Comply with UBC 7-2 and UL10C positive pressure where frame applied intumescent seals are required.
- G. Acceptable Manufacturers:
 - 1. Perimeter Gasketing:

Hager	Adhesive Applied
K.N. Crowder	726
Reese	
 - 2. Automatic Door Bottoms:

Hager	742S / 743S
K.N. Crowder	
Reese	

2.11 FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if within range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved samples.
- B. Comply with base material and finish requirements indicated by ANSI/BHMA A156.18 designations in hardware schedule.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine doors and frames, with Installers present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation. Examine pathway elements intended for cables. Check raceways and other elements for compliance with space

allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.

- C. Notify Architect via a prepared written report and endorsed by Installer of any discrepancies between the door schedule, door types, drawings and scheduled hardware. Report will have a list of conditions detrimental to application, to the proper and timely completion of the work and performance of the hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.02 INSTALLATION

- A. Install hardware using manufactures recommended fasteners and installation instructions, at height locations and clearance tolerances that comply with:
1. NFPA 80
 2. NFPA 105
 3. ICC/ANSI A117.1
 4. ANSI/BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames
 5. ANSI/BHMA A156.115W hardware Preparation in Wood Doors with Wood or Steel Frames
 6. DHI Publication – Installation Guide for Doors and Hardware
 7. Approved shop drawings
 8. Approved finish hardware schedule
- B. Install soffit mounted gaskets prior other soffit mounted hardware to provide a continuous seal around the perimeter of the opening without cutting or notching.
- C. Install door closers so they are on the interior of the room side of the door. Stairwell doors will have closers mounted on the stair side and exterior doors will be mounted on the interior side of the building.
- D. In drywall applications provide blocking material of sufficient type and size for hardware items that mount directly to the wall.
- E. Locate wall mounted bumper to contact the trim of the operating trim.
- F. Mount mop and kick plates flush with the bottom of the door and centered horizontally on the door.
- G. Set thresholds for exterior, and acoustical doors at sound control openings in full bed of sealant complying with requirements specified in Division 07 Section “Joint Sealants” forming a tight seal between threshold and surface to which set.
- H. Anchor all components firmly into position and use anchoring devices furnished with the hardware item, unless otherwise specified.

- I. Do not install surface mounted items until finishes have been completed on substrates involved. Set unit level, plumb and true to line location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- J. Power Supplies: locate power supplies as indicated and verified in the low-voltage coordination meeting.
- K. Install cables and wiring according to requirements in Division 28 Section "Conductors and Cables for Electronic Safety and Security" and with Division 26 Section "Grounding and Bonding for Electrical Systems." Cable installation shall comply with NECA 1, "Good Workmanship in Electrical Contracting" EIA/TIA-569, "Commercial Building Standard for Telecommunications Pathways and Spaces."
 - 1. Electromechanical Hardware: Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, transfer hinges, electrified hardware and access control equipment.
 - 2. Wiring color to be distinct and specific to the system. Coordinate cable colors with all other vendors to ensure color is not duplicated.
 - 3. Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use NRTL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables except in unfinished spaces.
 - 4. Install cables without damaging conductors, shield, or jacket.
 - 5. Boxes and enclosures containing security system components or cabling, and which are easily accessible to employees or to the public, shall be provided with a lock. Boxes above ceiling level in occupied areas of the building will not be considered to be accessible. Junction boxes and small device enclosures below ceiling level and easily accessible to employees or the public will be covered with a suitable cover plate and secured with tamperproof screws.
- L. Final connection of the system control switches (readers, keypads), monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the installed electromechanical door hardware according to operational narratives.

3.03 FIELD QUALITY CONTROL

- A. Material supplier to schedule final walk through to inspect hardware installation ten (10) business days before final acceptance of Owner. Material supplier will provide a written report detailing discrepancies of each opening to General Contractor within seven (7) calendar days of walk through.

3.04 ADJUSTMENT, CLEANING, AND DEMONSTRATING

- A. Adjustment: Adjust and check each opening to ensure proper operation of each item of finish hardware. Replace items that cannot be adjusted to operate freely and smoothly or as intended for application at no cost to Owner.
- B. Cleaning: Clean adjacent surfaces soiled by hardware installation. Clean finish hardware per manufacturer's instructions after final adjustments have been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no cost to Owner.
- C. Conduct a training class for building maintenance personnel demonstrating the adjustment, operation of mechanical and electrical hardware. Special tools for finish hardware to be turned over and explained usage at the meeting. Record all training and provide to the Owner for future reference.
- D. Demonstrate the functionality of the Access and Security System upon completion of installation, documenting the result of all tests and providing these results to the Owner. The Access and Security System will be tested in accordance with the following and by a factory authorized representative:
 - 1. Test and verify operation with connected equipment and network infrastructure.
 - 2. Test all devices and all operational features of the system for witness by the Owner's representative.
 - 3. Record all demonstrations and training, provide these to the Owner for future reference.

3.05 PROTECTION

- A. Leave manufacturer's protective film intact and provide proper protection for all other finish hardware items that do not have protective material from the manufacture until Owner accepts project as complete.

3.06 HARDWARE SET SCHEDULE

- A. Intent of Hardware Groups
 - 1. Should items of hardware not specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
 - 2. Where items of hardware aren't correctly specified and are required for completion of the Work, a written statement of such omission, error, or other discrepancy is required to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

- B. Guide: Door hardware items have been placed in sets which are intended to be a guide of design, grade, quality, function, operation, performance, exposure, and like characteristics of door hardware, and may not be complete. Provide door hardware required to make each set complete and operational.
- C. Hardware schedule does not reflect handing, backset, method of fastening, and like characteristics of door hardware and door operation.
- D. Review door hardware sets with door types, frames, sizes and details on drawings. Verify suitability and adaptability of items specified in relation to details and surrounding conditions.

3.07 HARDWARE SCHEDULE

	Set 1	
Door #X01	2-6 x 7-9 3/4 x 1-3/4	HM x HM
Door #X02	3-0 x 7-9 3/4 x 1-3/4	HM x HM
Each opening to have:		

All existing hardware to remain

	Set 2	
Door #N01, N03	3-0 x 7-0 x 1-3/4	WD x
HM		
Each opening to have:		
3	Hinges HA	BB1279 4.5" x 4.5" US26D
1	Passage Set US26D HA	3410 2-3/4" WTN ASA
1	Door Closer HA	5200 MLT ADJ 1-6 BF ALM
1	Kickplate HA	190S 10" x 2" LDW US32D
1	Mop Plate HA	190S 10" x 2" LDW US32D
1	Floor Stop HA	241F/243F US26D
1	Smoke Seal	726S 204" Char HA

Set 3

Door #N02

Each opening to have:

4	Hinges HA	BB1279 4.5" x 4.5"	US26D
1	Mortise Lock US26D HA	3880 Sect WTN Full6 SCC KD	
1	Electric Strike US32D HA	2930 MBD Fail Secure	
1	Power Supply	2903	HA
1	Card Reader	RE-USE EXISTING	
1	Door Closer HA	5200 MLT ADJ 1-6 BF	ALM
1	Kickplate HA	190S 10" x 2" LDW	US32D
1	Mop Plate HA	190S 10" x 2" LDW	US32D
1	Floor Stop HA	241F/243F	US26D
1	Smoke Seal	726S 204"	Char HA
1	Point to Point Diagram HA		
1	Riser Diagram		HA

Operation Narrative:

- Door is normally closed and locked
- Presenting credential or key override unlocks the mortise lock
- Upon power failure or fire system activation, the door remains locked, Fail Secure.

END OF SECTION

DIVISION 08

OPENINGS

SECTION 08 80 00

GLASS AND GLAZING

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.
- 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 Glass and Glazing work required to complete the work of the contract including all the Glass and Glazing work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Glass and Glazing work with all the other trades for the project. Provide all demolition and disposal work to complete the Glass and Glazing 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Glass and Glazing work includes, but is not limited to:
 - 1. All Glass and Glazing for vision panel in wood doors

1.03 SECTION INCLUDES

- A. Glazing units.
- B. Glazing compounds and accessories.

1.04 RELATED REQUIREMENTS

- A. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.
- B. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.
- C. Section 08 44 13 - Glazed Aluminum Curtain Walls: Glazing furnished as part of wall assembly.

1.05 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.
- C. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.
- D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- E. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.
- F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.
- G. GANA (GM) - GANA Glazing Manual; 2008.
- H. GANA (SM) - GANA Sealant Manual; 2008.
- I. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.
- J. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (2016).

1.06 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Convene a preinstallation meeting at least four weeks before starting work of this section; require attendance by each of the affected installers.

1.07 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Samples: Submit two samples 12 by 12 inch in size of glass units.

- E. Certificate: Certify that products of this section meet or exceed specified requirements.
- F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Glass Units: One of each glass size and each glass type.

1.08 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA (GM), GANA (SM), GANA (LGRM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.
- D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.09 FIELD CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.10 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Glass Fabricators:
 - 1. GGI - General Glass International: www.generalglass.com/#sle.
 - 2. JE Berkowitz, LP: www.jeberkowitz.com/#sle.
 - 3. Standard Bent Glass Corp: www.standardbent.com/#sle.
- B. Float Glass Manufacturers:
 - 1. AGC Glass North America, Inc; _____: www.agcglass.com/#sle.

2. Cardinal Glass Industries; _____: www.cardinalcorp.com/#sle.
3. Guardian Glass, LLC; _____: www.guardianglass.com/#sle.
4. Or Approved Equal.
5. Substitutions: Refer to Section 01 60 00 - Product Requirements.

2.02 GLASS MATERIAL

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 1. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
- B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.
 1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.03 GLAZING COMPOUNDS

- A. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920, Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.
- B. Manufacturers:
 1. BASF Corporation; _____: www.basf.com/#sle.
 2. Bostik Inc; _____: www.bostik-us.com/#sle.
 3. Dow Corning Corporation; _____: www.dowcorning.com/construction/#sle.
 4. or equal.

2.04 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Silicone, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
- C. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.
- D. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- E. Glazing Clips: Manufacturer's standard type.

2.05 SOURCE QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Provide shop inspection and testing for Type _____ glass.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that the minimum required face and edge clearances are being provided.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- D. Verify that sealing between joints of glass framing members has been completed effectively.
- E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.
- C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.
- D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.
- E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

- F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 FIELD QUALITY CONTROL

- A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.
- B. Monitor and report installation procedures and unacceptable conditions.

3.06 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove non-permanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.07 PROTECTION

- A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.
- B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

3.08 SCHEDULES

- A. Flush Wood Door Glazing:
 - 1. Interior: Glass Type _____, 1/4 inch thick, install glass using wet method with Type GC-___ glazing compound.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 21 16

GYPSUM BOARD ASSEMBLIES

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.
- 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 Gypsum Board Assemblies work required to complete the work of the contract including all the Gypsum Board Assemblies work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Gypsum Board Assemblies work with all the other trades for the project. Provide all demolition and disposal work to complete the Gypsum Board Assemblies 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Gypsum Board Assemblies work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Gypsum Board Assemblies work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows, but not limited to:
 - a. Gypsum wallboard walls and ceilings as indicated on the drawings

1.03 RELATED REQUIREMENTS

- A. Section 07 21 00 - Thermal Insulation.
- B. Section 07 92 00 - Joint Sealants - Filed Sub-Bid.
- C. Section 09 30 00 - Tiling: Tile backing board.
- D. Section 09 91 23 - Interior Painting - Filed Sub-Bid.
- E. Section 22 00 00 - Plumbing.
- F. Section 23 00 00 - HVAC.
- G. Section 26 00 00 - Electrical.

1.04 REFERENCE STANDARDS

- A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- C. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2017.
- D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.
- E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014, with Editorial Revision (2015).
- F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2017a.
- G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2016.
- H. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.
- I. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2017a.
- J. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.
- K. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2013.
- L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.
- M. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2018.

- N. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).
- O. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2016a.
- P. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

- A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich; ____: www.clarkdietrich.com/#sle.
 - 2. Jaimes Industries; ____: www.jaimesind.com/#sle.
 - 3. Marino; ____: www.marinoware.com/#sle.
 - 4. or equal.
- B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
 - 1. Studs: "C" shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
 - 3. Ceiling Channels: C-shaped.
 - 4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.
- C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and braced with continuous bridging both sides.

2.03 BOARD MATERIALS

- A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com.
 2. Georgia-Pacific Gypsum: www.gpgypsum.com.
 3. National Gypsum Company: www.nationalgypsum.com/#sle.
 4. USG Corporation: www.usg.com.
 5. Approved Equal.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 2. Glass mat faced gypsum panels as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - a. Mold resistant board is required at all locations.
 4. Thickness:
 - a. Vertical Surfaces: 5/8 inch.
 - b. Ceilings: 5/8 inch.
- C. Impact Resistant Wallboard:
1. Application: High-traffic areas indicated.
 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 3. Thickness: 5/8 inch.
 4. Edges: Tapered.
- D. Backing Board For Wet Areas: One of the following products:
1. Application: Surfaces behind tile in wet areas including shower surrounding and shower ceiling.
 2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 5/8 inch.
- E. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
 2. Thickness: 5/8 inch.
 3. Edges: Tapered.

2.04 GYPSUM WALLBOARD ACCESSORIES

- A. Acoustic Sealant: As specified in Section 07 92 00.
- B. Beads, Joint Accessories, and Other Trim: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.
 - 1. Corner Beads: Low profile, for 90 degree outside corners.
 - a. Products:
 - 1) CertainTeed Corporation; No-Coat Drywall Corner: www.certainteed.com/#sle.
 - 2) ClarkDietrich; Strait-Flex Big-Stick: www.clarkdietrich.com/#sle.
 - 3) Phillips Manufacturing Co; Everlast Corner Bead: www.phillipsmfg.com/#sle.
 - 4) Approved Equal.
 - 2. L-Trim with Tear-Away Strip: Sized to fit 5/8 inch thick gypsum wallboard.
 - a. Products:
 - 1) Phillips Manufacturing Co; gripSTIK L-Tear: www.phillipsmfg.com/#sle.
 - 2) Approved Equal.
- C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
 - 1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
 - 2. Joint Compound: Setting type, field-mixed.
- D. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- E. Nails for Attachment of Gypsum Panel Products: Not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
 - 1. Level ceiling system to a tolerance of 1/1200.
 - 2. Laterally brace entire suspension system.

3. Install bracing as required at exterior locations to resist wind uplift.
- C. Studs: Space studs at 16 inches on center.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- 3.03 BOARD INSTALLATION
- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
 - B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
 - C. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- 3.04 INSTALLATION OF TRIM AND ACCESSORIES
- A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
 - B. Corner Beads: Install at external corners, using longest practical lengths.
 - C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.
- 3.05 JOINT TREATMENT
- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, embed and finish with setting type joint compound.
 - B. Paper Faced Gypsum Board: Use fiberglass joint tape, embed with setting type joint compound and finish with setting type joint compound.
 - C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 1. Level 5: Required where glass mat faced panels are used.
 2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
 - D. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

LOWELL POLICE LOCKER ROOMS RENOVATIONS
CITY OF LOWELL
LOWELL, MASSACHUSETTS
CBI JOB NO.: CB190850

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

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

3.06 TOLERANCES

- A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 30 00

TILING

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.
- 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 Tiling work required to complete the work of the contract including all the Tiling work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Tiling work with all the other trades for the project. Provide all demolition and disposal work to complete the 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed. Provide labor, materials and equipment necessary to complete the work of this section.
- B. Tiling includes, but is not limited to:
 - 1. Install wall tile and floor tile in the showers.

1.03 SECTION INCLUDES

- A. Tile for floor applications.
- B. Cementitious backer board as tile substrate.

C. Ceramic accessories.

1.04 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 07 90 05 - Joint Sealers.
- C. Section 09 21 16 - Gypsum Board Assemblies: Tile backer board.

1.05 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2017.
- B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.
- C. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- D. ANSI A108.1c - Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Bed with Dry-Set or Latex-Portland Cement; 1999 (Reaffirmed 2010).
- E. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive; 2009 (Revised).
- F. ANSI A108.5 - American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- G. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).
- H. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2010).
- I. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).
- J. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).
- K. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2010 (Reaffirmed 2016).

- L. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).
- M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).
- N. ANSI A118.4 - American National Standard Specifications for Modified Dry-Set Cement Mortar; 2012 (Revised).
- O. ANSI A118.7 - American National Standard Specifications for High Performance Cement Grouts for Tile Installation; 2010 (Reaffirmed 2016).
- P. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).
- Q. ANSI A118.10 - American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes For Thin-Set Ceramic Tile And Dimension Stone Installation; 2014.
- R. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014.
- S. ANSI A118.15 - American National Standard Specifications for Improved Modified Dry-Set Cement Mortar; 2012.
- T. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2012.
- U. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2017.
- V. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.
- W. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- X. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- Y. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2017.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

- C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, ceramic accessories, and setting details.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Master Grade Certificate: Submit for each type of tile, signed by the tile manufacturer and tile installer.
- F. Installer's Qualification Statement:
 - 1. Submit documentation of National Tile Contractors Association (NTCA) or Tile Contractors' Association of America (TCAA) accreditation.
- G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Tile: 5 percent of each size, color, and surface finish combination, but not less than 10 sf of each type.

1.07 QUALITY ASSURANCE

- A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.
- B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- C. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.08 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Construct tile mock-up incorporating all components specified for the location.
 - 1. Minimum size of mock-up is 16sf.
 - 2. Approved mock-up may remain as part of the Work.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.10 FIELD CONDITIONS

- A. Do not install solvent-based products in an unventilated environment.

- B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

- A. Manufacturers: All products by the same manufacturer. Match existing.
 - 1. American Olean Corporation: www.americanolean.com/#sle.
 - 2. Dal-Tile Corporation: www.daltile.com/#sle.
 - 3. Emser Tile, LLC: www.emser.com/#sle.
 - 4. Or Approved Equal.
 - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Ceramic Mosaic Tile, Type Floor: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: 2 by 2 inch, nominal.
 - 3. Shape: Square.
 - 4. Edges: Square.
 - 5. Surface Finish: Matte glazed.
 - 6. Color(s): To be selected by Architect from manufacturer's standard range.
 - 7. Pattern: square.
- C. Glazed Wall Tile, Type __: ANSI A137.1, standard grade.
 - 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 - 2. Size: 4-1/4 by 4-1/4 inch, nominal.
 - 3. Surface Finish: Matte glaze.
 - 4. Color(s): To be selected by Architect and the Owner from manufacturer's standard range.
 - 5. Pattern: Square.
 - 6. Trim Units: Matching bead and bullnose shapes in sizes coordinated with field tile.

2.02 TRIM AND ACCESSORIES

- A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

1. Soap Dish: Without handle, Corner Unit design, surface mounted; Model # Caddy BA765 by Daltile or equal. Quantity (1) in each shower. cast strength sufficient to resist lateral pull force of 75 lbs.
- B. Ceramic Trim: Matching bullnose, cove base, and cove ceramic shapes in sizes coordinated with field tile.
 1. Applications:
 - a. Open Edges: Bullnose.
 - b. Inside Corners: Jointed.
 - c. Floor to Wall Joints: Cove base.
 2. Manufacturers: Same as for tile.

2.03 SETTING MATERIALS

- A. Manufacturers:
 1. ARDEX Engineered Cements: www.ardexamericas.com.
 2. Bostik Inc: www.bostik-us.com.
 3. LATICRETE International, Inc: www.laticrete.com.
 4. Merkrete, by Parex USA, Inc; _____: www.merkrete.com/#sle.
 5. TEC, an H.B. Fuller Construction Products Brand; _____: www.tecspecialty.com/#sle.
- B. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4.
 1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.
 2. Products:
 - a. ARDEX Engineered Cements; ARDEX N 23 MICROTEC: www.ardexamericas.com/#sle.
 - b. Custom Building Products; ProLite Premium Rapid Setting Large Format Tile Mortar, with Multi-Surface Bonding Primer: www.custombuildingproducts.com/#sle.
 - c. Merkrete, by Parex USA, Inc; Merkrete 735 Premium Flex: www.merkrete.com/#sle.
 - d. TEC, an H.B. Fuller Construction Products Brand; TEC Ultimate Large Tile Mortar: www.tecspecialty.com/#sle.
- C. Latex-Portland Cement Mortar Bond Coat: ANSI A118.4 or ANSI A118.15.

2.04 GROUTS

- A. Manufacturers:
 1. ARDEX Engineered Cements: www.ardexamericas.com.
 2. Bostik Inc: www.bostik-us.com.

3. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout:
www.laticrete.com/#sle.
 4. Merkrete, by Parex USA, Inc; Merkrete Duracolor Non-Sanded Color Grout:
www.merkrete.com/#sle.
 5. TEC, an H.B. Fuller Construction Products Brand; ____:
www.tecspecialty.com/#sle.
- B. High Performance Polymer Modified Grout: ANSI A118.7 polymer modified cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 3. Color(s): As selected by Architect from manufacturer's full line.
 4. Products:
 - a. ARDEX Engineered Cements; ARDEX FL:
www.ardexamericas.com/#sle.
 - b. Custom Building Products; Prism Color Consistent Grout:
www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout:
www.laticrete.com/#sle.
 - d. Merkrete, by Parex USA, Inc; Merkrete Pro Grout:
www.merkrete.com/#sle.
 - e. TEC, an H.B. Fuller Construction Products Brand; TEC AccuColor Plus Grout: www.tecspecialty.com/#sle.

2.05 MAINTENANCE MATERIALS

- A. Tile Sealant: Gunnable, silicone, siliconized acrylic, or urethane sealant; moisture and mildew resistant type.
1. Applications: Between tile and plumbing fixtures.
 2. Color(s): As selected by Architect from manufacturer's full line.
 3. Products:
 - a. ARDEX Engineered Cements; ARDEX SX:
www.ardexamericas.com/#sle.
 - b. Custom Building Products; Commercial 100% Silicone Caulk:
www.custombuildingproducts.com/#sle.
 - c. LATICRETE International, Inc; LATICRETE LATASIL:
www.laticrete.com/#sle.
- B. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.

1. Composition: Water-based colorless silicone.
2. Color(s): As selected by Architect from manufacturer's full line.

2.06 ACCESSORY MATERIALS

- A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
 1. Crack Resistance: No failure at 1/8 inch gap, minimum.
- B. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 1. Crack Resistance: No failure at 1/16 inch gap, minimum; comply with ANSI A118.12.
 2. Fluid or Trowel Applied Type:
 - a. Material: Synthetic rubber or Acrylic.
 - b. Thickness: 25 mils, minimum, dry film thickness.
 - c. Products:
 - 1) ARDEX Engineered Cements; ARDEX 8+9:
www.ardexamericas.com/#sle.
 - 2) TEC, an H.B. Fuller Construction Products Brand; TEC HydraFlex Waterproofing Crack Isolation Membrane:
www.tecspecialty.com/#sle.
 - 3) LATICRETE International, Inc; LATICRETE HYDRO BAN:
www.laticrete.com/#sle.
- C. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 5/8 inch thick; 2 inch wide coated glass fiber tape for joints and corners.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.

- b. Internal Relative Humidity: ASTM F2170.
- c. Moisture Vapor Emission: ASTM F1869.
- 2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.
- E. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

- A. Install tile and grout in accordance with applicable requirements of ANSI A108.1A thru A108.13, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Form internal angles square and external angles bullnosed.
- F. Install ceramic accessories rigidly in prepared openings.
- G. Sound tile after setting. Replace hollow sounding units.
- H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.
- I. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.
- J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.
- K. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

- A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 - 1. Use uncoupling membrane under all tile unless other underlayment is indicated.

3.05 INSTALLATION - SHOWERS AND BATHTUB WALLS

- A. At tiled shower receptors install in accordance with TCNA (HB) Method B415, mortar bed floor, and W244, thin-set over cementitious backer unit walls.
- B. At shower walls install in accordance with TCNA (HB) Method B412, over cementitious backer units with waterproofing membrane.
- C. Grout with standard grout as specified above.
- D. Seal joints between tile work and other work with sealant Type ____ specified in Section 07 90 05.

3.06 CLEANING

- A. Clean tile and grout surfaces.

3.07 PROTECTION

- A. Do not permit traffic over finished floor surface for 4 days after installation.

3.08 SCHEDULE

- A. Shower Floor:
 - 1. Tile: Ceramic.
 - a. Size: 2 by 2 in
 - b. Color: Color No. 1 for wall tile; Color No. 2 for base.
 - 2. Base: Coved, 4 inches high
 - 3. Installation Method: Mortar bed.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 51 00

ACOUSTICAL CEILINGS

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.
- 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 Acoustical Ceilings work required to complete the work of the contract including all the Acoustical Ceilings work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Acoustical Ceilings work with all the other trades for the project. Provide all demolition and disposal work to complete the 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed Provide labor, materials and equipment necessary to complete the work of this section.
- B. Acoustical Ceilings includes, but is not limited to:
 - 1. Provide and install acoustical ceiling tile and grid at all locations indicated on the Drawings. Contractor shall assist with coordinating final height of ceilings with all Filed sub-bidders, sub-contractors, Architect, and Engineers, and shall provide a laser level in each room after the existing ceilings are removed. Coordination is of utmost importance and shall commence immediately after

existing ceilings are removed in each room. No additional time shall be given for coordination of ceiling heights or preparation of coordination drawings.

1.03 RELATED REQUIREMENTS

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of special anchors or inserts for suspension system.
- B. Section 07 90 05 - Joint Sealers: Acoustical sealant.
- C. Section 22 00 01 - Plumbing
- D. Section 23 00 01 - HVAC
- E. Section 26 00 01 - Electrical

1.04 REFERENCE STANDARDS

- A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.
- C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2017.
- D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2014.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.
- C. Samples: Submit two full size samples illustrating material and finish of acoustical units.
- D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.07 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels:
 - 1. Armstrong World Industries, Inc: www.armstrong.com.
 - 2. CertainTeed Corporation: www.certainteed.com.
 - 3. Hunter Douglas Contract: www.hunterdouglascontract.com.
 - 4. USG: www.usg.com.
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc: www.armstrong.com.
 - 2. Acoustic Ceiling Products, Inc.: www.acpideas.com.
 - 3. CertainTeed Corporation: www.certainteed.com.
 - 4. Hunter Douglas Contract: www.hunterdouglascontract.com.
 - 5. USG: www.usg.com.
 - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Acoustical Units - General: ASTM E1264, Class A.
- C. Acoustical Panels, Type Cirrus, Tegular, Fine Texture by Armstrong, or approved equal: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - 2. Size: 24 by 24 inches.
 - 3. Thickness: 3/4 inch.
 - 4. Panel Edge: Tegular.
 - 5. Color: White.

2.03 SUSPENSION SYSTEM(S)

- A. Manufacturers:
 - 1. Armstrong World Industries, Inc; Product Exposed Tee grid, Prelude XL 15/16": www.armstrong.com, or approved equal
 - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
 - 1. System: Exposed Tee Grid, Prelude XL 15/16", by Armstrong or approved equal.
 - 2. Main, cross and concealed members:
 - a. Web design: Exposed "T"
 - b. Cold-Rolled Steel, minimum thickness of 0.020" electrozinc coated and factor painted low sheen satin.
 - c. Exposed flange: 15/16" width.
 - 3. Edge molding: Minimum 0.020" steel, angle shaped, with minimum flange width of 15/16".
 - 4. Rough Suspension:
 - a. Hanger wire: Minimum 12 guage, galvanized soft annealed, mild steel wire or hanger rod: 3/16" diameter.
 - b. Threaded rod for fixture support or hanger strap: 3/16" thick, 1" wide, zinc coated, flat steel strap for fixture support.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

- A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

- B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
- D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
- E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- I. Do not eccentrically load system or induce rotation of runners.

3.03 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Lay directional patterned units as indicated on the Drawings and centered in each space.
- D. Fit border trim neatly against abutting surfaces.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- F. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.

3.04 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 67 00

FLUID-APPLIED FLOORING - FILED SUB-BID

FILED SUB-BID REQUIRED - PAINTING

PART 1 GENERAL

1.00 FILED SUB-BIDS

- A. PAINTING is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID
- B. All sub-bids shall be submitted on the FORM FOR FILE SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.
- C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated on the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.
- D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, "NOTICE TO ALL BIDDERS", and the attention of the sub-bidders is directed thereto.
- E. The work to be completed by the Filed Sub-Bidder for the work of this section as described herein and as shown on the following listed Drawings: D1-01, D1-02 A1-01 through A3-02, H0-01 through H2-01, P1-01 through P2-01, and E0-01 through E1-01, ED-01 and FA0-01

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.
- 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 Fluid-Applied Flooring work required to complete the work of the contract including all the Fluid-Applied Flooring work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Fluid-Applied Flooring work with all the other trades for the project. Provide all demolition and disposal work to complete the Fluid-Applied Flooring 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Fluid-Applied Flooring work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Fluid-Applied Flooring work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Fluid-applied flooring and base.

1.03 RELATED REQUIREMENTS

- A. Section 07 92 00 - Joint Sealants.
- B. Section 04 20 00 - Unit Masonry - Filed Sub-Bid.
- C. Section 09 21 16 - Gypsum Board Assemblies.
- D. Section 09 91 23 - Interior Painting - Filed Sub-Bid.
- E. Section 22 00 00 - Plumbing.

1.04 REFERENCE STANDARDS

- A. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.
- B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2017.
- C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2017.
- D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.
- E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2017.
- F. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.
- C. Samples: Submit two samples, 3 by 3 inch in size illustrating color and pattern for each floor material for each color specified.
- D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.
- E. Manufacturer's Installation Instructions: Indicate special procedures.
- F. Manufacturer's Qualification Statement.
- G. Applicator's Qualification Statement.
- H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
 - 2. Extra Top Coat Materials: 2 gallons.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum ten (10) years documented experience.
- B. Applicator Qualifications: Company specializing in performing the work of this section.
 - 1. Minimum three (3) years of documented experience.
 - 2. Approved by manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store resin materials in a dry, secure area.
- B. Store materials for three days prior to installation in area of installation to achieve temperature stability.

1.08 FIELD CONDITIONS

- A. Maintain minimum temperature in storage area of 55 degrees F.
- B. Store materials in area of installation for minimum period of 24 hours prior to installation.
- C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.01 FLUID-APPLIED FLOORING SYSTEMS

- A. Fluid-Applied Flooring Type ____: Epoxy base coat(s) with embedded quartz aggregate.
1. Aggregate: Quartz granules.
 2. System Thickness: 1/8 inch, nominal, when dry.
 3. Texture: Slip resistant.
 4. Sheen: High gloss.
 5. Color: As selected by Architect.
 6. Basis of Design Product: Dur-A-Flex, Inc.; Dur-A-Quartz Q28.
 7. Products:
 - a. Sika Corporation; Sikafloor Quartzite Broadcast System: www.sikafloorusa.com/#sle.
 - b. Stonhard Group; Stonshield SLT: www.stonhard.com.
 - c. Approved Equal.

2.02 ACCESSORIES

- A. Wainscot Caps: Zinc with projecting base of 1/8 inch; color as selected.
- B. Cant Strips: Molded of flooring resin material.
- C. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.
- D. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.
- C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.
- D. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).
 1. Test as Follows:
 - a. Alkalinity (pH): ASTM F710.
 - b. Internal Relative Humidity: ASTM F2170.
 - c. Moisture Vapor Emission: ASTM F1869.

2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.

- E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

- A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.
- B. Prepare concrete surfaces according to ICRI 310.2R, to CSP level recommended by flooring manufacturer.
- C. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.
- D. Vacuum clean substrate.
- E. Apply primer to surfaces required by flooring manufacturer.

3.03 INSTALLATION - FLOORING

- A. Apply in accordance with manufacturer's instructions.
- B. Apply each coat to minimum thickness required by manufacturer.
- C. Finish to smooth level surface.
- D. Fillet and cove at vertical surfaces.

3.04 PROTECTION

- A. Prohibit traffic on floor finish for 48 hours after installation.
- B. Barricade area to protect flooring until fully cured.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 91 13

EXTERIOR PAINTING - FILED SUB-BID

FILED SUB-BID REQUIRED - PAINTING

PART 1 GENERAL

1.00 FILED SUB-BIDS

- A. PAINTING is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID
- B. All sub-bids shall be submitted on the FORM FOR FILE SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.
- C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated on the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.
- D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, "NOTICE TO ALL BIDDERS", and the attention of the sub-bidders is directed thereto.
- E. The work to be completed by the Filed Sub-Bidder for the work of this section as described herein and as shown on the following listed Drawings: D1-01, D1-02 A1-01 through A3-02, H0-01 through H2-01, P1-01 through P2-01, and E0-01 through E1-01, ED-01 and FA0-01

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.
- 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.

EXTERIOR PAINTING - FILED SUB-BID

1.02 WORK TO BE PERFORMED

- A. Provide all the Exterior Painting work required to complete the work of the contract including all the Exterior Painting work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Exterior Painting work with all the other trades for the project. Provide all demolition and disposal work to complete the Exterior Painting 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Exterior Painting work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete Exterior Painting work of the window security screens.

1.03 RELATED REQUIREMENTS

- A. Section 08 56 56 - Security Window Screens
- B. Section 07 92 00 - Joint Sealants.
- C. Section 09 91 23 - Interior Painting - Filed Sub-Bid.
- D. Section 23 00 00 - HVAC.
- E. Section 26 00 00 - Electrical.

1.04 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- C. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.
- D. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.
- E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- F. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).
 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 4. Manufacturer's installation instructions.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
1. Base Manufacturer: Benjamin Moore & Co.: www.benjaminmoore.com.
 2. PPG Paints: www.ppgpaints.com/#sle.
 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 4. Approved Equal.

- C. Primer Sealers: Same manufacturer as top coats.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.
 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- C. Colors: As indicated in Color Schedule.

2.03 PAINT SYSTEMS - EXTERIOR

- A. Paint MaE-OP-2A - Aluminum, Unprimed, electrostatic applied thermoplastic, polyester powder coating (2.5 mil min. thickness, applied and baked to a hard mar-finish: Color Black
 1. One coat etching primer.

2.04 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application in a 5-step bonderizing process.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Seal surfaces that might cause bleed through or staining of topcoat.
- D. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.
- D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 91 23

INTERIOR PAINTING - FILED SUB-BID

FILED SUB-BID REQUIRED - PAINTING

PART 1 GENERAL

1.00 FILED SUB-BIDS

- A. PAINTING is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID
- B. All sub-bids shall be submitted on the FORM FOR FILE SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.
- C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated on the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.
- D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, "NOTICE TO ALL BIDDERS", and the attention of the sub-bidders is directed thereto.
- E. The work to be completed by the Filed Sub-Bidder for the work of this section as described herein and as shown on the following listed Drawings: D1-01, D1-02 A1-01 through A3-02, H0-01 through H2-01, P1-01 through P2-01, and E0-01 through E1-01, ED-01 and FA0-01

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.
- 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 Interior Painting work required to complete the work of the contract including all the Interior Painting work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Interior Painting work with all the other trades for the project. Provide all demolition and disposal work to complete the Interior Painting 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Interior Painting work includes, but is not limited to:
1. All equipment, labor and services required to complete all Interior Painting work, including all items incidental thereto as specified herein and as shown on the Drawings.
 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Surface preparation as specified and as recommended by coating manufacturer..
 - b. Field application of paints.
 - c. Materials for backpriming woodwork.
 - d. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
 - 1) Provide and install primer and touch-up paint to match existing color and sheen at any areas disturbed by the work.
 - 2) Prime and paint existing and new CMU walls where indicated on the Drawings.
 - 3) Prime and paint all gypsum board wall assemblies.
 - 4) Prime and paint all new door frames.
 - 5) Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
 - 6) Surfaces inside cabinets.
 - 7) Mechanical and Electrical:
 - (a) In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
 - (b) In finished areas, paint shop-primed items.
 - (c) Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.

- (d) Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- e. Do Not Paint or Finish the Following Items:
 - 1) Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
 - 2) Items indicated to receive other finishes.
 - 3) Items indicated to remain unfinished.
 - 4) Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5) Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
 - 6) Marble, granite, slate, and other natural stones.
 - 7) Floors, unless specifically indicated.
 - 8) Ceramic and other tiles.
 - 9) Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
 - 10) Glass.
 - 11) Acoustical materials, unless specifically indicated.
 - 12) Concealed pipes, ducts, and conduits.

1.03 RELATED WORK UNDER OTHER SECTIONS

- A. Section 02 83 10 - Lead-Based Paint Awareness.
- B. Section 05 50 00 - METAL FABRICATIONS.
- C. Section 05 52 13 - Pipe and Tube Railings.
- D. Section 05 70 00 - Decorative Metal.
- E. Section 08 11 13 - Hollow Metal Doors and Frames.
- F. Section 08 14 16 - Flush Wood Doors.
- G. Section 08 31 00 - Access Doors and Panels.
- H. Section 09 21 16 - Gypsum Board Assemblies.
- I. Section 09 67 00 - Fluid-Applied Flooring.
- J. Section 09 91 13 - Exterior Painting - Filed Sub-Bid.
- K. Section 09 93 00 - Staining and Transparent Finishing: Wood Benches
- L. Section 09 97 23 - Concrete and Masonry Coatings.
- M. Section 21 00 00 - Fire Protection.
- N. Section 22 00 00 - Plumbing.
- O. Section 23 00 00 - HVAC.
- P. Section 26 00 00 - Electrical.

1.04 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.05 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- F. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).
- G. SSPC V1 (PM1) - Good Painting Practice: Painting Manual, Volume 1; 2016.
- H. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.
- I. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
- J. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).
- K. SSPC-SP 3 - Power Tool Cleaning; 1982, with Editorial Revision (2004).
- L. SSPC-SP 6 - Commercial Blast Cleaning; 2007.
- M. SSPC-SP 13 - Surface Preparation of Concrete; 1997 (Reaffirmed 2003).

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 2. MPI product number (e.g. MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 4. Manufacturer's installation instructions.
- C. Samples for initial color selection: Submit manufacturer's standard "fan deck" or equivalent collection of paper color chips illustrating full range of colors available.

1. Architect shall select three color options for each color to be used within the work, for final color selection.
 2. Quantity of color options to be selected is per final color for use in the work. Where multiple colors are specified for an individual finishing system, color options shall be selected for each final color up to the quantity indicated.
- D. Samples for final color selection: Submit two paper "draw down" samples, 8-1/2 by 11 inches in size, of each color option identified in initial color selection.
1. Where sheen is specified, submit samples in only that sheen.
 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens definitely not required.
 3. Allow 2 weeks for approval process, after receipt of complete samples by Architect.
 4. Paint color submittals will not be considered until color submittals for major materials not to be painted, including but not limited to masonry, factory finished metals, wood cabinets, wood doors, and floor finishes, have been approved.
- E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.
- F. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.
- G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
 3. Label each container with color, type, and room locations in addition to the manufacturer's label.
- 1.07 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
 - B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not apply materials before the building is weather tight.
- B. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- C. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- D. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- E. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candles measured mid-height at substrate surface.
- G. Provide adequate ventilation and outside air during application and manufacturer's recommended curing period.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Paints:
 - 1. Base Manufacturer: Benjamin Moore & Co.: www.benjaminmoore.com.
 - 2. PPG Paints: www.ppgpaints.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 4. Approved Equal.
- C. Primer Sealers: Same manufacturer as top coats, no exceptions except as approved in writing by all involved product manufacturers and accepted by the Architect.

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.
1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
 4. Supply each paint material in quantity required to complete entire project's work from a single production run.
 5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Volatile Organic Compound (VOC) Content:
1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. SCAQMD 1113 Rule.
 - c. Architectural coatings VOC limits of State in which the project is located.
 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- C. Flammability: Comply with applicable code for surface burning characteristics.
- D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- E. Number of Coats: Follow manufacturer recommendations for number of primer, base, and finish coats for all systems and substrates. Where manufacturer provides a range for number of coats, provide the greater number in all cases.
- F. Colors: As indicated on drawings.
1. Selection to be made by Architect after award of contract.
 2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

3. Extend colors to surface edges; colors may change at any edge or joint as directed by Architect.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.
5. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme approved by the Architect.

2.03 PAINT SYSTEMS - INTERIOR

- A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, wood, plaster, uncoated steel, shop primed steel, and aluminum.
1. Two top coats and one coat primer minimum, provide more where recommended by manufacturer.
 2. Paint I-OP-1 - Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
 - a. Products:
 - 1) Benjamin Moore Aura Waterborne Interior Matte 522
 - 2) Benjamin Moore Aura Waterborne Interior Eggshell 524 (MPI #138)
 - 3) Benjamin Moore Aura Waterborne Interior Semi-Gloss 528 (MPI #141)
 - 4) PPG Paints Manor Hall Interior Flat, 82-100.
 - 5) PPG Paints Manor Hall Interior Eggshell, 82-300. (MPI #138)
 - 6) PPG Paints Manor Hall Interior Semi-Gloss, 82-500. (MPI #141)
 - 7) Sherwin-Williams Emerald Interior Latex, Flat K35.
 - 8) Sherwin-Williams Emerald Interior Latex, Satin K37.
 - 9) Sherwin-Williams Emerald Interior Latex, Semi-Gloss K38. (MPI #141).
 - 10) Approved Equal.
 3. Top Coat Sheen:
 - a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.
 - b. Eggshell: MPI gloss level 3; use this sheen at all locations unless noted otherwise.
 - c. Semi-Gloss: MPI gloss level 5; use this sheen at high traffic and/or wet areas.
 4. Primer: As recommended by top coat manufacturer for specific substrate.
- B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:
1. Medium duty applications include doors and door frames.

2. Two top coats and one coat primer minimum, provide more where recommended by manufacturer.
3. Paint I-OP-MD-DT-4 - Top Coat(s): Interior Alkyd; MPI #47, 48, 81, or 96.
 - a. Products:
 - 1) Benjamin Moore Super Spec Alkyd Semi-Gloss Enamel C271 (MPI #47)
 - 2) Benjamin Moore Super Spec HP Urethane Gloss Enamel P22 (MPI #48)
 - 3) PPG Paints Glyptex Interior Alkyd Enamel, Semi-Gloss, 439-10 Series. (MPI #47)
 - 4) PPG Paints Glyptex Interior/Exterior Alkyd Enamel, Gloss, 4139-10 Series. (MPI #48)
 - 5) Sherwin-Williams ProMar 200 Alkyd Semi-Gloss (MPI #47).
 - 6) Sherwin-Williams ProMar 200 Alkyd Gloss (MPI #48).
 - 7) Approved Equal.
 4. Top Coat Sheen:
 - a. Eggshell: MPI gloss level 3; use this sheen where noted.
 - b. Semi-Gloss: MPI gloss level 5; use this sheen at all locations unless noted otherwise.
 - c. Gloss: MPI gloss level 6; use this sheen where noted.
 5. Primer: As recommended by top coat manufacturer for specific substrate.

2.04 PRIMERS

- A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
 1. Interior/Exterior Latex Block Filler; MPI #4.
 - a. Products:
 - 1) Kilz Pro-X p50 Block Filler Primer.
 - 2) PPG Paints: 6-15XI Speedhide Masonry Hi Fill Latex Block Filler. (MPI #4)
 - 3) Rodda Sprayable Block Filler, 501901. (MPI #4)

2.05 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 GENERAL

- A. Where the execution requirements of this section differ from the manufacturer's recommendation, the more stringent criteria shall apply, at the sole discretion of the Architect.

3.02 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter, unless other means are recommended by paint manufacturer for the specific substrate. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.
 - 2. Plaster and Stucco: 12 percent.
 - 3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
 - 4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
 - 5. Concrete Floors and Traffic Surfaces: 8 percent.

3.03 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or repair existing paints or finishes that exhibit surface defects.
- D. Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing. Items that are not practical to be removed may be masked in place, where approved by the Architect.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Report evidence of mildew, mold, or moisture to the Architect prior to proceeding with the work.

- G. Concrete:
1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 2. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.
- H. Masonry:
1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
 2. Prepare surface as recommended by top coat manufacturer.
- I. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- J. Gypsum Board: Fill minor defects with filler compound. Sand and spot prime defects after repair.
- K. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- L. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
- M. Copper: Remove contamination by steam, high pressure water, or solvent washing.
- N. Ferrous Metal:
1. Solvent clean according to SSPC-SP 1.
 2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.
- O. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried. Spot prime all fillers. Sand before each finish coat. Back prime concealed surfaces before installation.
- P. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

- Q. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.04 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- G. Sand wood and metal surfaces lightly between coats to achieve required finish.
- H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

DIVISION 09

FINISHES

SECTION 09 93 00

STAINING AND TRANSPARENT FINISHING

FILED SUB_BID REQUIRED – PAINTING

PART 1 GENERAL

1.00 FILED SUB-BIDS

- A. WATERPROOFING is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID
- B. All sub-bids shall be submitted on the FORM FOR FILE SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.
- C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated on the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.
- D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, “NOTICE TO ALL BIDDERS”, and the attention of the sub-bidders is directed thereto.
- E. The work to be completed by the Filed Sub-Bidder for the work of this section as described herein and as shown on the following listed Drawings: D1-01, D1-02 A1-01 through A3-02, H0-01 through H2-01, P1-01 through P2-01, and E0-01 through E1-01, ED-01 and FA0-01

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.
- 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 Staining and Transparent Finishing work required to complete the work of the contract including all the Staining and Transparent Finishing work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Staining and Transparent Finishing work with all the other trades for the project. Provide all demolition and disposal work to complete the Staining and Transparent Finishing 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Staining and Transparent Finishing work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Staining and Transparent Finishing work for refinishing existing wood benches and application on new wood benches.

1.03 RELATED REQUIREMENTS

- A. Section 06 20 00 - Finish Carpentry.
- B. Section 09 91 23 - Interior Painting: Stains and transparent finishes.

1.04 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.05 REFERENCE STANDARDS

- A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2016.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Submittals, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category.
 - 2. Manufacturer's installation instructions.
- C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 6x18 inch in size.

- D. Manufacturer's Instructions: Indicate special surface preparation procedures.
- E. Manufacturer's Qualification Statement.
- F. Applicator's Qualification Statement.
- G. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Stain and Transparent Finish Materials: 1 gallon of each color and type; from the same product run, store where directed.
 - 2. Label each container with color and type in addition to the manufacturer's label.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years documented experience.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.09 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.
- D. Minimum Application Temperature: 50 degrees F unless required otherwise by manufacturer's instructions.

- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide finishes used in any individual system from the same manufacturer; no exceptions.
- B. Stains:
 - 1. Base Manufacturer: Benjamin Moore & Co.: www.benjaminmoore.com/.
 - 2. PPG Paints Flood Exterior Stains: www.flood.com/#sle.
 - 3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
 - 4. Approved Equal.

2.02 STAINS AND TRANSPARENT FINISHES - GENERAL

- A. Finishes:
 - 1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 3. Supply each finish material in quantity required to complete entire project's work from a single production run.
 - 4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Colors: To be selected from manufacturer's full range of available colors.
 - 1. Selection to be made by Architect after award of contract.

2.03 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

- A. Finish on Wood Benches
 - 1. Stain: Semi-Transparent Stain for Wood; MPI #90.
 - a. Products:
 - 1) PPG Paints Deft Interior Oil-Based Fast Dry Stain, DFT570 Series. (MPI #90)
 - 2) PPG Paints Deft Interior Oil-Based Wood Stain, DFT400 Series. (MPI #90)
 - 3) Sherwin-Williams MinWax 250 VOC Oil Stain. (MPI #90)
 - 4) or Approved equal.
 - 2. Top Coat(s): Polyurethane Varnish, High Build.
 - a. Products:

- 1) Sherwin-Williams MinWax High Build Polyurethane, Gloss.
- 2) Sherwin-Williams MinWax High Build Polyurethane, Satin.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
 1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

3.03 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- D. Reinstall items removed prior to finishing.

3.04 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10 21 13.17

PHENOLIC TOILET COMPARTMENTS

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.
- 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 Phenolic Toilet Compartments work required to complete the work of the contract including all the Phenolic Toilet Compartments work shown on the plans, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Phenolic Toilet Compartments work with all the other trades for the project. Provide all demolition and disposal work to complete the Phenolic Toilet Compartments 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Phenolic Toilet Compartments work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Phenolic Toilet Compartments work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.

1.03 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Blocking and supports.
- B. Section 10 28 00 - Toilet, Bath, and Laundry Accessories.

1.04 REFERENCE STANDARDS

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- B. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2015.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.06 SUBMITTALS

- A. Product Data: Provide data on panel construction, hardware, and accessories.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Samples: Submit two samples of partition panels, 12 by 12 inch in size illustrating panel finish, color, and sheen.
- D. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Phenolic Toilet Compartments:
 - 1. All American Metal Corp - AAMCO: www.allamericanmetal.com/#sle.
 - 2. Partition Systems International of South Carolina; Phenolic Toilet Partitions: www.psisc.com/#sle.
 - 3. Approved Equal.

2.02 PHENOLIC TOILET COMPARTMENTS

- A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-to-ceiling.
 - 1. Color: Single color as selected.
- B. Doors:
 - 1. Thickness: 3/4 inch.
 - 2. Width: 24 inch.
 - 3. Width for Handicapped Use: 36 inch.

4. Height: 58 inch.
- C. Panels:
 1. Thickness: 1/2 inch.
 2. Height: 58 inch.
- D. Pilasters:
 1. Thickness: 3/4 inch.
 2. Width: As required to fit space; minimum 3 inch.
- E. Screens: Without doors; to match compartments; mounted to wall with two panel brackets with vertical support/bracing same as compartments.
- F. Embossed Finish

2.03 ACCESSORIES

- A. Pilaster Shoes: Formed ASTM A666, Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings.
 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
 2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.
- B. Head Rails: Hollow anodized aluminum, 1 inch by 1-1/2 inch size, with anti-grip profile and cast socket wall brackets.
- C. Wall and Pilaster Brackets: Polished stainless steel; manufacturer's standard type for conditions indicated on drawings.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hardware: Satin stainless steel:
 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
 2. Door Latch: Slide type with exterior emergency access feature.
 3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
 4. Coat hook with rubber bumper; one per compartment, mounted on door.
 5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.04 ADJUSTING

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

END OF SECTION

DIVISION 10

SPECIALTIES

SECTION 10 28 00

TOILET AND BATH ACCESSORIES

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.
- 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. Contractor to install Owner provided Toilet Accessories and provide and install other accessories as indicated on the drawings, listed in the specification, and needed to install a complete assembly in every way, with all reinforcing, pinning, and finishes. Coordinate the Toilet and Bath Accessories work with all the other trades for the project. Provide all demolition and disposal work to complete the Toilet and Bath Accessories 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 sub-contractor, and each file sub-bidder for the entire project so that all the work can be properly and completely performed.
- B. Toilet and Bath Accessories work includes, but is not limited to:
 - 1. All equipment, labor and services required to complete all Toilet and Bath Accessories work, including all items incidental thereto as specified herein and as shown on the Drawings.
 - 2. Scope of Work: As follows and as indicated on the drawings.
 - a. Commercial toilet accessories.
 - b. Under-lavatory pipe supply covers.

1.03 RELATED REQUIREMENTS

- A. Section 06 10 00 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates and above ceiling framing.
- B. Section 10 21 13.19 – Phenolic Toilet Compartments.
- C. Section 22 00 00 - Plumbing.

1.04 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.
- B. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- D. ASTM B86 - Standard Specification for Zinc and Zinc-Aluminum (ZA) Alloy Foundry and Die Castings; 2013.
- E. ASTM C1036 - Standard Specification for Flat Glass; 2016.
- F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.
- G. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2015.
- H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004, with Editorial Revision (2016).

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Submittals, for submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.
- C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

1.07 QUALITY ASSURANCE

- A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.
- B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

- C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations. Protect from damage.

1.09 WARRANTY

- A. Manufacturer's Warranty for Washroom Accessories: Manufacturer's standard 1 year warranty for materials and workmanship.
- B. Manufacturer's Warranty for Electric Hand Dryers: Manufacturer's standard 5 year warranty on parts, except 3 year warranty on motor brushes from date of purchase.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Commercial Toilet, Shower, and Bath Accessories:
 - 1. AJW Architectural Products: www.ajw.com.
 - 2. ASI - American Specialties, Inc: www.americanspecialties.com.
 - 3. Bradley Corporation: www.bradleycorp.com.
 - 4. Georgia-Pacific Professional: www.blue-connect.com/#sle.
 - 5. Approved Equal.
- B. Under-Lavatory Pipe Supply Covers:
 - 1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
 - 2. Approved Equal.

2.02 MATERIALS

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.
- C. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

2.03 FINISHES

- A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES

- A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick

satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:

1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Material: Cotton, machine washable, and mildew-resistant.
3. Size: 36 by 72 inches, hemmed edges.
4. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
5. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Towel Bar: Stainless steel, 3/4 inch square tubular bar; rectangular brackets, concealed attachment, satin finish.

D. Mirrors: Stainless steel framed, 1/4 inch thick tempered safety glass; ASTM C1048.

1. Size: 16" x 24".
2. Frame: 0.05 inch channel shapes, with mitered corners, and tamperproof hanging system; No.4 finish.
3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and no absorptive filler material.
4. Fixed Tilt Mirrors: Minimum 3 inches tilt from top to bottom.

E. Grab Bars: Stainless steel, smooth surface.

1. Standard Duty Grab Bars:

- a. Push/Pull Point Load: 250 pound-force, minimum.
- b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
- c. Finish: Satin.
- d. Length and Configuration: As indicated on drawings.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
4. Color: White.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.

3.02 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

3.03 INSTALLATION

- A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.
 - 1. Grab Bars: As indicated on drawings.
 - 2. Mirrors: As indicated on drawings.
 - 3. Other Accessories: As indicated on drawings.

3.04 PROTECTION

- A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

DIVISION 22

PLUMBING

SECTION 22 00 00

PLUMBING
FILED SUB-BID REQUIRED

PART 1 - GENERAL

1.01 FILED SUB-BIDS

- A. Plumbing is stipulated as a Filed Sub-Bid under Part B, Item 2 of the Form for General Bid
- B. All sub-bids shall be submitted on the Form for Sub-Bid furnished by the Awarding Authority, as required by Section 44F of Chapter 149 of the Massachusetts General Laws, as amended.
- C. Sub-Bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated, on the date stipulated in the Invitation for Bids.
- D. Specific information relating the sub-bidders is set forth in the Contract Documents, under the heading "Notice to All Bidders, including Sub-Bidders" and the attention of sub-bidders is directed thereto.
- E. The Trade Contractor shall perform the complete trade work, including the following listed sub-trade classes of work, with employees on its own payroll unless the Trade Contractor identifies on the bid form, the name of a sub-trade subcontractor that will perform each of the following classes of sub-trade work and the corresponding sub-trade subcontract sum.
- F. The work to be done under this section is shown on Drawings numbered: P0-01, P0-02, P1-01, and P1-02.

1.02 GENERAL REQUIREMENTS

- A. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01000 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. Examine all Drawings and all Sections of the Specifications for requirements therein affecting the work and this Section. The exact scope of work cannot be determined without a thorough review of all specification sections and other contract documents.

1.03 WORK INCLUDED

- A. Work in this section includes providing labor, materials, equipment and services necessary for a complete and safe installation in accordance with the Contract Documents and all applicable codes and authorities having jurisdiction.

- B. Building

- 1. Provide demolition of all plumbing fixtures as indicated on drawings.
- 2. Provide all required coring, cutting and patching for the renovation.
- 3. Provide all plumbing fixtures as indicated.
- 4. Provide all required domestic water, sanitary and vent connections to all new fixtures. Provide and extend from the existing domestic water, sanitary and vent systems, connections to the new plumbing fixtures for complete and operational plumbing systems.
- 5. Provide all staging, hoisting and firestopping.

- C. General

- 1. Valves
- 2. Sleeves, inserts, hangers and accessories
- 3. Pipe identification and valve tags
- 4. Flanges, union fittings and couplings
- 5. Firestopping at piping and sleeves
- 6. Cleaning and testing
- 7. Cutting, coring and patching
- 8. Supplementary steel for piping and equipment supports
- 9. Operating and maintenance manuals
- 10. Guarantee
- 11. Shop drawings and reproducible record drawings which shall indicate all aspects of the entire plumbing systems installations. These drawings shall be on reproducible drawings at 1/8" scale and on AutoCAD release 2007 as a minimum.
- 12. Necessary supervision and coordination information to any other trades involved in the construction, to accommodate space, support or service requirements for equipment and piping provided under this Section of the Specifications.

13. All materials and labor necessary for installation and operation of equipment, furnished by others, requiring plumbing services and/or work that would fall under the jurisdiction or review of the plumbing inspector.
14. Cutting and Patching as outlined in this section.
15. When open-flame or spark producing tools such as blower torches, welding equipment, etc., are required in the process of executing the work, the General Contractor shall be notified not less than 24 hours in advance of the time that the work is to begin and the location where the work is to be performed. Provide, where necessary, fire protective covering and maintain a constant non-working fire watch where work is being performed and until completed.
16. Examine all Project Specifications and Drawings for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.

1.04 RELATED WORK AND REQUIREMENTS

- A. Principal classes of work related to the work of this Section are listed below, and are specified to be performed under the indicated sections of the Specifications. Refer to the indicated sections for description of the extent and nature of the indicated work, and for coordination with related trades. This listing may not include all related work items, and it is the responsibility of the contractor to fully coordinate the work of this Section with that of all other trades.
 1. Section 07 84 13 – Firestopping

1.05 REFERENCES

- A. For products or workmanship specified by association, trades, or federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. The date of the standard is that in effect as the Bid date, except when a specific date is specified.
- C. Schedule of References:
 1. ANSI American National Standards Institute
 2. ASME American Society of Mechanical Engineers
 3. ASTM American Society for Testing and Materials
 4. AWWA American Water Works Association
 5. IEEE Institute of Electrical & Electronics Engineers
 6. CISPI Cast Iron Soil Pipe Institute
 7. PDI Plumbing and Drainage Institute
 8. NFPA National Fire Protection Association
 9. UL Underwriters' Laboratories, Inc.

- 10. OSHA Occupational Safety and Health Administration
- 11. MSS Manufacturers Standardization Society

1.06 SUBMITTALS

- A. Conform to the requirements of the submittals, Section 01 30 00, for schedule and form of all submittals. Coordinate this submittal with submittals for all other finishes.
- B. Materials List: Before purchasing materials for the work, submit to the Architect/Engineer a complete list showing (1) the materials specified, and (2) the equivalent materials proposed for use, including description of product, if the Plumbing Contractor desires to use materials other than those specified.
 - 1. All materials shall be approved by the Architect/Engineer before commitment for materials is made. Intention of using specified materials shall not relieve the Contractor from submitting the items listed herein.
- C. Proposed Products List:
 - 1. Backflow Preventers
 - 2. Hangers and Supports
 - 3. Piping, Fittings, Unions and Couplings
 - 4. Valves
 - 5. Insulation
- D. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- E. Mark dimensions and values in units to match those specified.
- F. Submit Material Safety Data Sheets (MSDS) on each product with submittal.

1.07 CODES, ORDINANCES, AND PERMITS

- A. Installation of systems and equipment provided under this section shall be done in strict accordance with the Massachusetts State Building and Plumbing Codes, with local supplements, Department of Environmental Protection Agency, Massachusetts Architectural Access Board and any and all state and local requirements of the Authority Having Jurisdiction.
- B. All materials provided under this Contract shall be approved for use in the State of Massachusetts, and installed in strict accordance with the Massachusetts State Plumbing Code.
- C. Give all notices, file all plans, obtain all permits, pay all fees and licenses and obtain all necessary approvals from authorities having jurisdiction. Deliver all certificates

of inspection to the authorities having jurisdiction. No work shall be covered before examination and approval by Architect/Engineer, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work conforming to requirements, satisfactory to Architect, and without extra cost to the Owner. If work is covered before due inspection and approval, the installing contractors shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.08 SEQUENCING AND SCHEDULING

- A. Construct work in sequence under provisions of Division 01.

1.09 RECORD DRAWINGS

- A. Refer to Division 01, of the Specifications for record drawings and procedures to be provided under this section.

1.10 JURISDICTIONAL DISPUTES

- A. In order to avoid any jurisdictional disputes and work stoppage that could arise during the completion of the work shown on the Drawings or as specified herein, the Plumbing Contractor will be held responsible for subletting any work shown or specified herein, but not classified as plumbing work.

1.11 PROTECTION OF WORK AND PROPERTY

- A. The Plumbing Contractor shall be responsible for the care and protection of all work included under this Section until it has been tested and accepted.
- B. Protect all equipment and materials from damage from all causes including theft. All materials and equipment damaged or stolen shall be repaired or replaced with equal material or equipment.
- C. Protect all equipment, outlets and openings with temporary plugs, caps and covers. Protect work and materials of other trades from damage that might be caused by work or workmen under this Section and make good damage thus caused.

1.12 SAFETY PRECAUTIONS

- A. Life safety shall be a primary consideration. The contractor shall provide all required and prudent material, labor and equipment to comply with applicable safety regulations. Further, the Plumbing Contractor shall similarly provide all material, labor and equipment to comply with reasonable or generally accepted safety precautions as directed by the Owner or the Architect.
- B. Comply with all of the safety requirements of OSHA throughout the entire construction period of the project.

- C. Furnish, place and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and property.
- D. Perform work only in areas of the building as approved by the Owner or his representative. Personnel and equipment access to the site, laydown areas, parking areas and areas of work shall only be as designated and allowed by the Owner.
- E. Also refer to Division 01, Safety Requirements.

1.13 INTERPRETATION OF DRAWINGS AND SPECIFICATIONS

- A. It is the intention of the Specifications and Drawings to call for complete, finished work, tested and ready for continuous operation. Any apparatus, appliance, material or work not shown on the Drawings, but mentioned in the Specifications or vice-versa, or any incidental accessories necessary to make the work complete in all respects and ready for operation, even if not particularly specified, shall be provided by the Plumbing Contractor without additional expense to the Owner.
- B. The Drawings are generally diagrammatic. The locations of all items that are not definitely fixed by dimensions are approximate only. The exact locations must be determined at the project and shall have the approval of the Architect before being installed. The Plumbing Contractor shall follow Drawings, including his shop drawings, in laying out work and shall check the Drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions. Where space conditions appear inadequate, notify the Architect before proceeding with the installation. The Plumbing Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.
- C. Refer to the Architectural, Structural, and Electrical plans and coordinate location of all plumbing equipment and piping.
- D. Size of pipes and methods of running them are shown, but it is not intended to show every offset and fitting, nor every structural difficulty that may be encountered. To carry out the true intent and purpose of the Drawings, all necessary parts to make complete approved working systems ready for use, shall be furnished without extra charge. All work shall be installed in such a manner as to avoid being unsightly.
- E. Should it appear that there is a real or an apparent discrepancy between the drawings and specification, it shall be assumed that the Plumbing Contractor based his bid on doing work in a more expensive manner.

1.14 OPERATION AND MAINTENANCE MANUALS

- A. Prepare and submit maintenance and operating manuals as described in, **PROJECT CLOSEOUT**, section of specifications. Submit six (6) complete hard copy sets and digital copy on a thumb drive, of operation and maintenance manuals.
- B. Table of Contents:
 - 1. Introduction:
 - a. Explanation of Manual and its use.
 - b. Description of Piping Systems.
 - 2. System Operation
 - 3. Maintenance
 - a. Recommended List of Spare Parts: Furnish two (2) typed sets of instructions for ordering spare parts with sectional views of the fittings or equipment showing parts numbered or labeled to facilitate ordering replacements. Each set shall include a list with itemized prices of those parts recommended to be kept on hand as spares, as well as the name and address of where they may be obtained.
 - b. System draining and filling instructions.
 - 4. Manufacturer's Literature:
 - a. All items as listed under Submittals, Paragraph 1.05.

1.15 UNDERWRITERS LABEL AND LISTING

- A. All electrical apparatus furnished under this Section shall be approved by UL and shall be labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

1.16 CUTTING AND PATCHING

- A. All cutting and patching necessary for the proper installation of work to be performed under this Section and subsections shall be performed by the Plumbing Contractor. All cutting and patching associated with demolition work necessary for the installation of work under this section shall be by the General Contractor.
- B. All work shall be fully coordinated with all phases of construction, in order to minimize the requirements for cutting and patching.
- C. The Plumbing Contractor shall form all chases or openings for the installation of his own work, or shall cut the same in existing work and shall see that all sleeves or forms are in the work and properly set in ample time to prevent delays. He shall see

that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and shall consult with the Architect and the Contractors or Contractors concerned in reference to this work. In so doing, he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Architect/Engineer.

- D. The Plumbing Contractor shall carefully fit around, close up, repair, patch, and point around the work specified herein to match the adjacent surfaces and to the entire satisfaction of the Architect/Engineer.
- E. The Plumbing Contractor shall fill and patch all openings or holes left in the existing structures by the removal of existing equipment by himself.
- F. All of this work shall be carefully done by workmen competent to do such work and with the proper and smallest tools applicable.
- G. Any cost caused by defective or ill-timed work shall be borne by the Plumbing Contractor responsible therefore.
- H. Provide all cutting and patching work required for installation of materials and equipment under this section of the specifications, in such a manner so as to leave the work complete and in a condition that matches the corresponding area.
- I. When, in order to accommodate the work required under this section of the specifications, finished materials of other trades must be cut or fitted, furnish the necessary drawings and information to the trades whose materials must be cut or fitted.
- J. Do all required drilling and cutting of holes in concrete walls and floors for the installation of sleeves and supports provided under this section of the specification.
- K. After installation of pipe lines, the Contractor shall neatly patch, repair, and replace work where damaged, removed or altered for pipe line installation. This work shall be similar and equal in quality to the work removed or damaged, unless otherwise shown or specified. Such work shall include patching of masonry work, and wherever any such patching work is indicated on drawings or otherwise required.
- L. The fire resistance rating of floors, walls, and ceilings shall be maintained. UL listed firestopping shall be installed in accordance with manufacturer's written instructions. Firestopping shall be performed in strict conformance with Division 7.

1.17 GUARANTEE

- A. Submit manufacturer's standard replacement warranties for material and equipment furnished under this Section. Such warranties shall be in addition to and not in lieu

of all liabilities which the manufacturer and Contractor may have by law or by provisions of the Contract Documents. All warranties shall be submitted prior to Final Payment.

- B. All materials, equipment and work furnished under this Section shall be guaranteed against all defects in materials and workmanship for a minimum period of one (1) year commencing with the date of Substantial Completion. Any failure due to defective material, equipment or workmanship which may develop shall be corrected at no expense to the Owner including all damage to areas, materials and other systems resulting from such failures.
- C. Guarantee that all elements of each system meet the specified performance requirements as set forth herein or as indicated on the Drawings.
- D. Upon receipt of notice from the Owner of the failure of any part of the systems during the guarantee period, the affected parts shall be replaced. Any equipment requiring excessive service shall be considered defective and shall be replaced.

1.18 OBTAINING INFORMATION

- A. Obtain from the manufacturer the proper method of installation and connection of the equipment that is to be furnished and installed. Obtain all information that is necessary to facilitate the work and to complete the project.

1.19 GIVING INFORMATION

- A. Keep fully informed as to the size and shape and location of all openings required for all apparatus and give full information to all other Contractors. Furnish all supports required for installation of apparatus herein specified.

1.20 COOPERATION AND COORDINATION WITH OTHER TRADES

- A. The work shall be so performed that the progress of the entire building construction including all other trades shall not be delayed nor interfered with. Materials and apparatus shall be installed as fast as conditions of the building will permit and must be installed promptly when and as desired.
- B. Confer with all other trades relative to location of all apparatus and equipment to be installed and select locations so as not to conflict with work of other Sections. Any conflicts shall be referred immediately to the Architect/Engineer for decision to prevent delay in installation of work. All work and materials placed in violation of this clause shall be readjusted to the Architect's satisfaction, at no expense to the Owner.
- C. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section will interfere with

work of other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 1/8-inch scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so as to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.

- D. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work. Furnish and set in place all sleeves, pockets, supports and incidentals.
- E. All distribution systems which require pitch or slope such as storm and sanitary drains and water piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.
- F. The Plumbing Contractor shall, with the approval of the Architect and without extra charge, make reasonable modifications in his work as required by normal structural interferences, or by interference with work of other trades, or for proper execution of the work.
- G. The Plumbing Contractor shall protect all materials and work of other trades from damage that may be caused by his work and shall make good any damages so caused.
- H. This contractor shall submit Requests for Information (RFI's) regarding the work of this section in accordance with the provisions of Division 01.

1.21 MATERIAL AND EQUIPMENT STANDARDS

- A. All equipment and material must be approved by the Architect/Engineer prior to use. Substitutions may be offered for review provided the material, equipment or process offered for consideration is equal in every respect to that indicated or specified and only if the term "approved equal" appears. The request for each substitution must be accompanied by complete specifications together with drawings or samples to properly appraise the materials, equipment or process.
- B. If a substitution of materials or equipment in whole or in part is made, the Plumbing Contractor shall bear the cost of any changes necessitated by any other trade as a result of said substitution.
- C. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved by the Massachusetts State Board of Plumbers and Gas Fitters.

1.22 CERTIFICATES OF APPROVAL

- A. Upon completion of all work, furnish, in duplicate, certificates of inspections from the manufacturers stating that authorized factory engineers have inspected and tested the operation of their respective equipment and found same to be in satisfactory operating condition.

1.23 SUPERVISION

- A. Supply the service of an experienced and competent supervisor who shall be in charge of the plumbing work at the site.

1.24 DELIVERY, STORAGE AND HANDLING

- A. All manufactured materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and product identification.
- B. Protect materials against dampness. Store off floors, under cover, and adequately protected from damage.
- C. Deliver products to site and store and protect same under the provisions of Division 1.
- D. Thoroughly inspect all plumbing equipment and materials upon receipt at the job site for damage and correctness.

1.25 ACCESSIBILITY

- A. All work shall be installed so that parts requiring inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from the Architect.

1.26 ACCESS PANELS

- A. Furnish access panels for walls and ceilings at locations indicated on drawings or as required to permit access for adjustment, removal, replacement and servicing of all concealed plumbing equipment requiring access and all other items requiring maintenance and adjustment. In addition to where indicated on this Drawing, access doors shall be required for access to each concealed piping system isolation valve. Access panels shall be in strict conformance with Division 8. All access panels shall be submitted to the Architect for approval.
- B. Installation shall be by the General Contractor.
- C. All access panels shall be located and positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 12" x 12").

1.27 SLEEVES, INSERTS, ANCHOR BOLTS, AND PLATES

- A. Be responsible for the location of and the maintaining in proper position all sleeves, inserts and anchor bolts supplied and/or set in place. In the event that failure to do so requires cutting and patching of finished work, it shall be done at this Contractor's expense without any additional cost to the Owner.
- B. Sleeves passing through fire walls and fire rated floors and barriers, shall be made tight using approved caulking or fireproofing materials as necessary. Fire rated material shall be UL listed and shall match the rating of the wall, floor or barrier penetrated.
- C. The fire resistance rating of floors, walls, and ceilings shall be maintained. UL listed firestopping shall be installed in accordance with manufacturer's written instructions.

1.28 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

- A. Provide all supplementary steel, channels and supports required for the proper installation, mounting and support of all plumbing equipment, piping, etc., required by the Specifications.
- B. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect/Engineer.
- C. The type and size of the supporting channels and supplementary steel shall be determined by the Plumbing Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

1.29 DEFINITIONS

- A. As used in this Section, the following items are understood to have the following meaning:
 - 1. Work shall mean all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.
 - 2. Concealed shall mean hidden from sight in chases, furred-in spaces, shafts, hung ceilings, embedded in construction or in a crawl space.
 - 3. Exposed shall mean not installed underground or concealed as defined above.
 - 4. Provide shall mean furnish and install.
 - 5. Contractor shall mean plumbing contractor.

1.30 HOISTING, SCAFFOLDING AND PLANKING

- A. The work to be done under this Section of the Specifications shall include the furnishing, set-up and maintenance of all derricks, hoisting machinery, scaffolds, staging and planking as required for the work.

1.31 COORDINATION

- A. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the project.
- B. Furnish to all other trades advance information on location and size of all equipment, frames, boxes, sleeves, and openings needed for the work under this section of the specifications, and also furnish layout information and shop drawings necessary to permit trades affected by the work under this section of the specifications to install their work properly coordinated and without delay.
- C. Where there is evidence that work installed under this section of the specifications interferes with the work of other trades, assist in working out space conditions to make satisfactory adjustments.
- D. With the approval of the Architect/Engineer and without extra cost to the Owner, make reasonable modifications in work specified under this section of the specifications required to coordinate with normal structural interferences, lights, diffusers, and ductwork or for proper execution of specified work.
- E. If work is installed before coordinating with other trades so as to cause interference with the work of such trades, make all necessary changes in work under this section of the specifications at no additional cost to the Contract.
- F. Protect all materials and work of other trades from damage that may be caused by the work required under this section of the specifications and be responsible for repairing any damages caused by such work without any additional cost to the Contract.
- G. Where work of this section will be installed in close proximity to work of other sections or where there is evidence that the work of this section will interfere with work of other sections or existing conditions, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 1/8-inch scale or larger working drawings and sections, clearly showing how this work is to be installed in relation to the work of other sections. If the work of this section is installed before coordinating with other trades or so to cause interference with work of other trades, make changes necessary to protect conditions without extra charge.
- H. The plumbing contractor shall carefully coordinate with all existing conditions at the site while preparing the coordination drawings. All work shown on the plumbing contractor's coordination drawings shall be fully coordinated with all existing conditions at the site to ensure that all work shall fit in the spaces. The plumbing contractor shall make reasonable changes to the contract drawings in order to accommodate existing conditions without extra charge.

1.32 COORDINATION DRAWINGS

- A. General: General Contractor shall prepare and provide one accurately scaled set of building “base sheets” in CAD format for production of Coordination Drawings. The Coordination Drawings shall at not less than at 1/8 inch for all areas. General Contractor shall establish CAD layer standards for each trade and shall be responsible for distribution to each trade. The sequence of Coordination Drawings shall be Contractor-Structural-HVAC-Electrical-Plumbing-Fire Protection-Contractor. Upon review and approval of coordination drawings, the General Contractor shall provide a complete set to the owner on 4 mil reproducible mylar and electronic files in CAD format.

- B. The Plumbing Contractor, the Electrical Contractor, and the General Contractor shall coordinate all HVAC, plumbing, electrical, structural and fire protection work with that of each trade in order to:
 - 1. Avoid interferences between general construction, mechanical, electrical, structural and other specialty trades.
 - 2. Maintain clearances and advise other trades of clearance requirements for operation, repair, removal and testing of mechanical equipment.
 - 3. Indicate aisle ways and access ways required on coordinated shop drawings for mechanical equipment rooms, electrical rooms.
 - 4. Coordinate location of sleeves and inserts.
 - 5. Coordinate installation sequence.

PART 2 - PRODUCTS

2.01 SANITARY WASTE AND VENT PIPING

- A. Hubless Cast-Iron Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.
 - a. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.
 - b. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

- B. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
 - 1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.

2.02 POTABLE AND NO-POTABLE COLD-WATER PIPING

- A. Hard Copper Tube: ASTM B 88, Type L water tube.
 - 1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
 - 2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
 - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- B. Basis of Design: Nibco or approved equal.

2.03 INDIRECT WASTE PIPING

- A. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings
- B. Basis of Design: Nibco or approved equal.

2.04 BACKFLOW PREVENTERS

- A. General: ASSE standard, backflow preventers.
 - 1. NPS 2 and Smaller: Bronze body with threaded ends.
 - a. Interior Lining: AWWA C550 or FDA-approved, epoxy coating for backflow preventers having cast-iron or steel body.
 - 2. Interior Components: Corrosion-resistant materials. Lead free certified.
 - 3. Exterior Finish: Polished chrome plate if used in chrome-plated piping system.
 - 4. Strainer: Provide strainer on inlet. Include draw off valve with cap and chain.
- B. Reduced-Pressure-Principle Backflow Preventers: ASSE 1013, suitable for continuous pressure application. Include outside screw and yoke gate valves on inlet and outlet, and strainer on inlet; test cocks; and pressure-differential relief valve with ASME A112.1.2 air-gap fitting located between two positive-seating check valves.
 - 1. Reduced pressure principal backflow preventer shall be Massachusetts D.E.P. approved, complete with ball valves and stainer on sizes up to 2", air gap fitting, bronze construction for sizes up to 2". The plumbing contractor shall register all backflow preventers with the Massachusetts D.E.P.
 - 2. Vacuum breakers at all hose bibbs and outlets subject to backflow shall be atmospheric type. Provide pressure type for all outlets subject to back pressure or static line pressure.

- C. Installation of all backflow preventers shall be in accordance with Massachusetts State Plumbing Code and Department of Environmental Protection regulations 310 CMR 22.22 "cross connections".
- D. Reduced pressure principal and double check assemblies shall be registered with and approved by Massachusetts D.E.P. or its agent prior to installation. This shall be done by the plumbing contractor. A scale drawing of the project showing the locations, types and model numbers of all backflow prevention devices and vacuum breakers shall be created by the plumbing contractor and submitted to the local water authority for approval. Approval of all backflow prevention devices shall be obtained by the plumbing contractor from the local water authority prior to the purchasing of any backflow prevention devices.
- E. Contractor shall provide repair kits for each reduced pressure and double check backflow preventer.
- F. Reduced Pressure Assemblies shall be located in the horizontal plane only, with the bottom of the unit between three and four feet above the floor and a minimum of 12" clearance from the outside of the unit to the face of the wall.
- G. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
- H. Strainers: Y-pattern, unless otherwise indicated, and full size of connecting piping. Include ASTM A 666, Type 304, stainless-steel screens with 3/64-inch round perforations, unless otherwise indicated.
 - 1. Pressure Rating: 125-psig minimum steam working pressure, unless otherwise indicated.
 - 2. NPS 2 and Smaller: Bronze body, with female threaded ends.
 - 3. Y-Pattern Strainers: Screwed screen retainer with centered blowdown.
- I. Basis of Design: Watts LF909QT-S-AG-C or approved equal.

2.05 VALVES

- A. Valves in the interior domestic water piping systems (cold water, hot water, and hot water return) shall be as manufactured by Conbraco, Apollo, Milwaukee or approved equal. Manufacturer's model numbers used herein are intended as a guide to quality and type of valve to be provided.
 - 1. Ball valves, 2 inches and smaller: bronze body, solder ends, Apollo 77-100/200 series, TFE seats, lever handle.
 - 2. Drain valves: Apollo 78-100 series 3/4 inch all bronze hose end ball valve with cap and chain, provide Conbraco hose end vacuum breaker.

2.06 UNIONS AND FLANGES

- A. Unless otherwise specified herein, unions for copper and brass piping two inches and smaller shall be 125 pounds (steam working pressure) brass ground joint type. Larger than 2 inches in diameter shall be 150 pounds flat faced brass flanges conforming to ANSI Standard B16.24. Flanges shall have copper clad steel bolts and nuts and 1/16-inch minimum thickness red rubber full faced gaskets.
1. Where brass flanges and ferrous flanges are to be joined, ferrous flanges shall be full faced.
 2. Mating of ferrous and non-ferrous flanges shall be separated with rubber gaskets (1/16-inch minimum thickness) and teflon liners installed in the bolt holes. Bolt holes shall be drilled to receive the teflon liners. Physical contact between the ferrous and non-ferrous flanges including the bolts, nuts, and washers will not be permitted.
 3. Unions or flanges shall be installed at all equipment connections.

2.07 CLEANOUTS

- A. Exposed Cast-Iron Cleanouts - **CO**:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.
 2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
 3. Size: Same as connected drainage piping
 4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
 5. Closure: Raised-head cast-iron plug.
 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Cast-Iron Floor Cleanouts **FCO**:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.
 2. Standard: ASME A112.36.2M for heavy-duty, adjustable housing cleanout.
 3. Size: Same as connected branch.
 4. Type: Threaded, adjustable housing.

5. Body or Ferrule: Cast iron.
6. Clamping Device: Not required.
7. Outlet Connection: No-hub.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Light Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to clean out.

C. Cast-Iron Wall Cleanouts – WCO:

1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. MIFAB, Inc.
 - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - d. Tyler Pipe; Wade Div.
 - e. Watts Drainage Products Inc.
 - f. Zurn Plumbing Products Group; Specification Drainage Operation.
 - g. <Insert manufacturer's name.>
2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Raised-head brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round nickel-bronze wall-installation frame and cover.

2.08 FLOOR DRAINS

A. Cast-Iron Floor Drains – FD-x as indicated on the plumbing schedule:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn or a comparable product by one of the following:
 - a. Josam Company; Josam Div.
 - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - c. Watts Drainage Products Inc.

2. Standard: ASME A112.6.3.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Seepage Flange: Required.
6. Anchor Flange: Not required.
7. Clamping Device: Not required.
8. Outlet: Bottom.
9. Backwater Valve: Not required.
10. Coating on Interior and Exposed Exterior Surfaces: Not required.
11. Sediment Bucket: Required.
12. Top or Strainer Material: Nickel bronze.
13. Top of Body and Strainer Finish: Rough bronze.
14. Top Shape: Square.
15. Dimensions of Top or Strainer: As indicated on Drawing P0-01.
16. Top Loading Classification: Light Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Cast iron.
20. Trap Pattern: Deep-seal P-trap.
21. Trap Features: Trap-seal primer valve drain connection.

B. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 side inlet.

C. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

2.09 HANGERS, INSERTS AND SUPPORTS

- A. All piping shall be rigidly supported from the building structures by means of approved hangers and supports. Piping shall be supported to maintain required grading and pitching of line, to prevent vibration and to secure piping in place, and shall be arranged so as to provide for expansion and contraction. In no case shall risers or mains contact building structures. Seismic restraints shall be provided on gas piping systems as required.

- B. All materials specified in this section which occur above suspended ceilings shall be supported directly from the building structures. The suspended ceiling system shall not be utilized to support any plumbing materials. All hangers, inserts and supports shall be Carpenter Patterson, Calco, Walworth, or equal.
- C. All hangers shall be secured to approved adjustable type, stainless steel inserts wherever possible and practicable. Field drilling, where required, shall be by the Plumbing Contractor. The use of explosives is prohibited.
- D. All sanitary, waste, vent, storm drain and water pipes shall have friction clamps at each floor.
- E. Hangers shall be installed, as required, to meet code compliance as to location/spacing and Manufacturer's Standardization Society (MSS) Standard Practice Bulletins SP-58 and 69.
- F. Hanger material shall be compatible with piping materials with which it comes into contact unless otherwise noted.
- G. Hangers shall be installed, in addition to the above, at all changes of direction (horizontal and vertical), valves and equipment connections. Hangers shall be located so that their removal is not required to service, assemble or remove equipment.
- H. Horizontal runs may use Type "1A" band hangers up to 4" size. Piping larger than 4" shall be provided with clevis type.
- I. Vertical support shall be by means of riser clamps (anchors with split ring type allowable up to 2" size only) and adjustable pipe support with flange anchored to floor.
- J. Where three or more pipes are running parallel to each other, factory fabricated gang pipe hangers with pipe saddle clips or rollers may be used in lieu of the hereinbefore specified hangers. These hangers shall be sized to provide for insulation protectors as hereinafter specified. Pipe saddle clips shall be not less than 16-gauge metal. Where pipe rollers are provided for insulated copper piping, insulation protectors shall be provided at each set of rollers and filled with a section of heavy density fiberglass pipe covering that extends a minimum of 12" beyond the roller.
- K. Insulation protectors (shields) for horizontal piping shall be constructed of galvanized steel formed to a 180-degree arc and 12 inches long, 18 gauge for hangers 5 inches in size and smaller, 16 gauge for hangers larger than 5 inches in size.
- L. Rods, clamps and hangers shall be electro-galvanized coated.

- M. Valve and piping supports, from the floor, shall be adjustable pipe support and complete with pipe standard and flange, anchored to floor. Supports shall be installed at each control valve, riser tee or elbow and where any unsupported section exceeds 4'-0" in length measured along piping centerline.

2.10 SLEEVES

- A. All pipes passing through floors, walls, or partitions shall be provided with sleeves having an internal diameter with a minimum of two inches larger than the outside diameter of the pipe or insulation on covered lines.
- B. Sleeves through outside walls and slabs on grade shall be Schedule 40 galvanized steel pipe with a 150-pound steel slip on welding flanges, welded at the center of the sleeve and shall be painted with one coat of bitumastic paint, inside and outside.
- C. Sleeves through masonry floors and interior masonry walls shall be Schedule 40, black, steel pipe. Sleeves through interior non-masonry walls or partitions shall be 22-gauge galvanized sheet steel.
- D. The sleeves through outside walls and slab on grade shall be provided with pipe to wall penetration closures. Seals shall be mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bolt head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. The Plumbing Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint.
- E. Sleeves through walls shall terminate flush with face of wall. Sleeves through floor shall terminate 1" above finished floor.
- F. Required fire resistance of floors and walls shall be maintained where penetrations occur. Fire stopping at sleeves shall be installed per manufacturer recommendations. Fire stopping material shall be UL listed for the service and fire rating. Provide asbestos-free firestopping material capable of maintaining an effective barrier against flame, gases, and temperature. Provide noncombustible firestopping that is nontoxic to human beings during installation or during fire conditions. Devices and equipment for firestopping service shall be UL FRD listed or FM P7825 approved for use with applicable construction, and penetrating items.
 - 1. Fire Hazard Classification: Material shall have a flame spread of 25 or less, a smoke developed rating of 50 or less when tested in accordance with UL 723 or UL listed and accepted.
 - 2. Firestopping Rating: Firestopping materials shall be UL FRD listed or FM P7825 approved for "F" and "T" ratings at least equal to fire-rating of fire

wall or floor in which penetrated openings are to be protected, except that “F” and “T” ratings may be 3 hours for firestopping in through-penetrations of 4-hour fire rated wall or floor.

- G. Escutcheons shall be provided with a set screw to properly hold escutcheon in place and provided at all exposed floor and wall penetrations. Escutcheons on C.P. piping shall be chrome plated.

2.11 INSULATION

- A. General: The pipe covering specified herein for piping system shall be provided in strict accordance with the manufacturer’s printed instructions, the best practice of the trade and to the full intent of this specification.

1. The sealers, tapes, adhesives and mastics used in conjunction with the installation of the pipe covering specified herein shall possess the maximum possible fire-safe qualities available and shall be of a type approved by Factory Mutual, Factory Insurance Association or National Fire Protection Association.
2. Valves, fittings, flanges and accessories shall have the same thickness of pipe covering applied as the adjacent pipe. Pipe covering for these items shall be factory PVC molded type (Zeston or approved equal).
3. Longitudinal seams and butt joint shall be sealed with a fire retardant, vapor barrier adhesive.

- B. All Interior Water Systems Piping

1. All interior water piping and horizontal storm drain systems shall be insulated and shall be 4-pound density, fiberglass with factory applied white, fire retardant, reinforced, vapor barrier jacket, 1/2-inch-thick for piping up to 1-1/4” and 1” for piping 1-1/2” and larger. Insulation shall be continuous through sleeves.
2. Ends of insulation at termination points shall be sealed to the pipe with a pre-molded PVC type fitting. Pipe fittings and valves shall be provided with pre-molded PVC covers with fiberglass inserts.
3. Pipe insulation in all mechanical rooms, non-conditioned wet areas and the gymnasium and in all areas where the piping will be exposed to view shall be provided with 20 mil. PVC white continuous covers in addition to the vapor barrier Jacket. Fittings and seams shall be solvent welded. Pipe fittings and valves shall be similarly insulated and covered.

- C. Insulation at hangers shall be protected with galvanized steel shields.

- D. Fire Hazard Rating: Insulation materials, coatings and other accessories shall individually have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Ratings shall be determined by U.L. “Test

Method for Fire Hazard Classification of Building Materials”, No. 823 or NFPA No. 225 or ASTM E84.

PART 3 - EXECUTION

3.01 DEMOLITION

- A. The existing facility will be occupied during demolition work.
- B. Where sections of a system are to be removed and the system serves other areas of the building that are outside the immediate scope of the work, perform the following:
 - 1. Coordinate the temporary shut down of the system with the Owner’s representative.
 - 2. Install supports in the remaining active sections of the system as required by the removal of nearby supports associated with the demolition.
 - 3. Isolate the system.
 - 4. Cap the remaining system section, leaving the remainder of the system active.
- C. Provide temporary shoring or bracing during the demolition work to prevent movement, settlement, or collapse of the system or adjacent systems due to the work.
- D. Promptly repair any damage caused to adjacent facilities or areas that are designated to remain at no additional cost to the Owner.
- E. Materials/Equipment:
 - 1. Coordinate with all Contractors to provide disconnection prior to equipment removal.
 - 2. Remove material/equipment by unfastening at the supports or attachments. Then remove the attachments from the building, leaving no component of the original installation.
 - 3. The Owner shall have the option to choose to take possession of the equipment or not. If the Owner chooses not to take possession of the equipment, remove and drop equipment/materials to floor for removal/disposal by the General Contractor.
 - 4. Exercise care with equipment that is to be relocated or turned over to the Owner, examine the equipment before removal in the presence of the Owner’s representative to determine its condition. Make a record of any marks, etc. by a photograph or videotape acknowledged by the Owner’s representative.
 - 5. Install relocated equipment to ensure no damage.
 - 6. Equipment to be turned over to the Owner: Deliver to an on-site location designated by the Owner, and obtain acknowledgment of receipt in good condition the following equipment.

- F. Remove existing equipment and appurtenances as indicated on demolition plans and as required to install the new systems.

3.02 IDENTIFICATION

A. General

1. All equipment and piping provided under this Section of the Specifications shall be marked for ease of identification.
2. Marking shall be done using self-adhering labels applied to clean, smooth surfaces. All lettering shall have a sharply contrasting background for ease of identification. Colors shall be in accordance with ANSI Standards. Samples of stickers together with color schedules shall be submitted for approval.

B. Equipment

1. Equipment marking shall be prominently located on the normally visible side of the equipment.
2. Equipment identification designations shall be taken from equipment schedules as indicated on the Drawings.

C. Pipe Identification

1. Provide color coded pipe identification markers on all piping in the building installed under this Section. Pipe markers shall be heavy plastic faced cloth labels with heat resistant backing, "Set Mark" by Seton Nameplate Corporation, Zipper Tubing Co., or equal by the W. H. Brady Company or approved equal.
2. Provide an arrow marker with each pipe content marker to indicate the direction of flow.
3. Piping mains shall be labeled at 20-foot intervals and on entrance and exit from the Mechanical Room, adjacent to each valve and at both sides of wall penetrations. This work shall be done after finish painting has been completed.
4. The following color coding shall be used with names in black letters on backgrounds indicated:

SCHEDULE OF PIPING IDENTIFICATION		
Service	Legend	Background Color
Domestic Cold-Water Piping	Cold Water	Blue
Non-Potable Cold-Water Piping	Irrigation	Yellow

5. In general, a 2" high legend shall be used for pipe lines 4" diameter and larger, and a ¾" high legend shall be used for pipe lines 3" diameter and smaller.
6. All markers shall be OSHA approved.
7. All Exposed piping systems shall be painted in accordance with ANSI standards.

D. Valve tags

1. All valves on pipes of every description shall have neat circular black and white laminated fibre-engraved white showing through tags of at least 1½" in diameter, attached with a brass hook to each valve stem. Stamp on these valves' tags in letters, as large as practical, the number of the valve and the service such as indicated on the "Valve List". The numbers on each service shall be consecutive. All valves on tanks and pumps shall be numbered by 3" black and white laminated fibre-engraved white showing through discs with white numbers 2" secured to stem of valves by means of brass hooks or small solid link brass chain.
2. The valve numbers shall correspond with numbers indicated for valves and controls on two printed valve lists prepared by the Plumbing Contractor. These printed lists shall state the numbers and locations of each valve and control and the section, fixture or equipment which it controls, and other necessary information, such as requiring the opening or closing of another valve when one valve is to be opened or closed.
3. The valve lists shall be prepared in a form to meet the approval of the Architect and shall be mounted framed under glass at the direction of the Owner.

3.03 TESTING

A. General

1. All labor, materials, instruments, devices and power required for testing shall be provided by the Plumbing Contractor. The tests shall be performed in the presence and to the satisfaction of the Owner's Representative and such other parties as may have legal Jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing.
2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.
3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury shall be retested in part or in whole as directed.

4. The Architect/Engineer retains the right to request a recheck or resetting of any pump or instrument by this contractor during the guarantee period at no additional cost to the Contract.
5. Repair or replace any defective work with new work without extra charge to the Contract. Repeat tests as directed, until the work is proven to meet the requirements specified herein.
6. Restore to its finished condition any work, damaged or disturbed, provided by other contractors and engage the original contractor to do the work of restoration to the damaged or disturbed work.
7. The fixtures shall be tested for stability of support and satisfactory operation. The piping shall be tested when directed by the Contractor for stability.
8. After the fixtures are set and connected, and the piping systems to same have been tested, this Plumbing Contractor shall turn water on the fixtures, and equipment, fill the traps, etc., and the proper operation of all items shall be demonstrated by him in the presence of and to the satisfaction of the Architect or their designated representatives.
9. Caulking of screwed joints or holes in piping will not be acceptable.
10. This Plumbing Contractor shall notify the any inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness his scheduled tests.

B. Specific:

1. Potable and Non-Potable Cold-Water Piping Systems:
 - a. Upon completion of the roughing-in and before setting fixtures and final connection to all equipment, all water piping systems shall be tested to a hydrostatic pressure of 125 PSIG.
 - b. Each system's test shall be maintained for eight hours without a drop in pressure.
 - c. After testing, provide complete adjustment of all parts of each water system until design distribution or balancing is obtained throughout.

3.04 DISINFECTION, CLEANING AND ADJUSTING

A. Disinfection

1. Each water system shall be cleaned and disinfected by this Plumbing Contractor. Cleaning and disinfection shall be performed after all pipes, valves, fixtures and other components of the system are installed, tested and ready for operation.
2. All water piping shall be thoroughly flushed with clean potable water, prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and re-installed after completion of disinfection.

3. Disinfection shall be done using sodium hypochlorite in the following manner:
 - a. A service cock shall be provided and located at the water service entrance and at each branch piping system to a phase. The disinfecting agent shall be injected into and through the system from this cock only.
 - b. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply shall not be permitted.
 - c. All sectional valves shall be opened during disinfection. All outlets shall be fully opened at least twice during injection and the residual checked with orthotolidin solution.
 - d. When the chlorine residual concentration, calculated on the volume of water the piping will contain, indicates not less than 50 PPM (parts per million) at all outlets, then all valves shall be closed and secured.
 - e. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.
 - f. After the retention, the residual shall be not less than five parts per million. If less, then the process shall be repeated as described above.
 - g. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall not be greater than the incoming water supply (this may be zero).

4. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:
 - a. Name and location of the job and date when disinfection was performed.
 - b. Material used for disinfection.
 - c. Retention period of disinfectant in piping system.
 - d. PPM chlorine during retention.
 - e. PPM chlorine after flushing.
 - f. Statement that disinfection was performed as specified.
 - g. Signature and address of company/person performing disinfection.

5. Upon completion of final flushing (after retention period), this Contractor shall obtain a minimum of one water sample from each hot and cold-water line and submit samples to a State-approved laboratory. Samples shall be taken from the faucets located at highest floor and furthest from meter or main water supply. The laboratory report shall show the following:
 - a. Name and address of approved laboratory testing the samples.
 - b. Name and location of job and date the samples were obtained.

c. The coliform organism count (an acceptable test shall show absence of coliform organisms).

6. If analysis does not satisfy the above minimum requirements, the disinfection procedure shall be repeated.
7. Before acceptance of the systems, the Plumbing Contractor shall submit to the Architect/Engineer for his review, three (3) copies of Certification of Performance as specified above.
8. Under no circumstances shall the Plumbing Contractor permit the use of any portion of domestic water system until properly disinfected, flushed and certified.

B. Cleaning and Adjusting

1. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.
2. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings, due to the Plumbing Contractor's failure to properly clean the piping system shall be repaired by the Plumbing Contractor at no increase in Contract costs.
3. At the completion of the work, all water systems shall be adjusted for quiet operation.
4. All automatic control devices shall be adjusted for proper operation.
5. All plumbing fixtures and exposed metal work shall be adjusted for proper operation. Floor drain strainers and traps shall be cleaned of all debris.
6. All items of equipment shall be thoroughly inspected and any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Architect for inspection and approval.

3.05 SPECIAL TOOLS

- A. Provide any and all special tools, recommended by the manufacturer of items furnished, noted as not being commonly available.

3.06 CERTIFICATES OF APPROVAL

- A. Upon completion of the work, furnish to the Owner, in duplicate, certificates of inspection and/or approval from state and local Inspection authorities having jurisdiction indicating the installed systems compliance to their requirements.

3.07 QUIET OPERATION

- A. All work provided under this Section of the Specifications shall operate under conditions of load without sound or vibration which is abnormally objectionable for such equipment in the opinion of the Architect. In case of moving machinery, sound or vibration noticeable outside of the room in which it is installed, or annoyingly noticeable inside its own room will be considered objectionable shall be corrected in an approved manner by the Plumbing Contractor at no change in Contract amount.

3.08 SYSTEMS

A. Indirect Piping (Interior)

1. The Plumbing Contractor shall be responsible for checking each pipe for alignment, center line elevation and invert grade for underground installations.
2. The indirect drainage piping three inches and smaller in diameter shall pitch a minimum of 1/4 inch per foot, and piping four inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.
3. The changes in direction of each drainage system shall be made with "Wye" branches and 1/8 bends. Provide long sweep bends at bottom of stacks with a vertical cleanout just above the floor at places where a "Wye" and 1/8 bends at bottom of stacks and end cleanouts cannot be installed.

B. Potable and Non-Potable Cold-Water Piping

1. Vacuum breakers and/or backflow preventers shall be installed on supplies to each piece of equipment, and hose-end valved connection, as required, to prevent back-siphonage and backflow.
2. Branch lines from water service or main lines shall be taken off the top or bottom of main, using such crossover fittings as may be required by structural or installation conditions. All water service pipes, fittings, and valves shall be kept a sufficient distance from other work and not less than one inch between coverings on the different services.
3. Water piping shall be run parallel and graded evenly to the drainage points. There shall be a minimum 1/2" hose-end drain valve with hole-end vacuum breaker provided for each low point in the piping, so that all parts of each water system can be drawn-off. Piping 2" and smaller shall have a 3/4" size drain valve.
4. All piping connections to equipment shall be provided with unions or flanges to permit convenient disassemble for alterations and repairs.
5. No piping shall be installed in a manner to permit back siphonage or backflow of any flow of water from the waste non-potable or process system into the domestic water systems or their distribution piping under any conditions. Approved backflow preventers shall be installed where cross-connections are required.
6. Where flanges are installed in the water systems, install red rubber gaskets between each pair of flanges.

7. Heating and/or bending of copper tubing to eliminate the installation of fittings will not be permitted (exception: flexible risers between fixture stop and kitchen/lavatory faucet).
8. Piping systems shall be kept clean during all phases of work. Open ends of incomplete piping shall be protected to prevent the entrance of foreign materials.
9. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.

3.09 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation

1. Install piping approximately as shown on the drawings, based on the existing conditions or as directed during installation by the Architect/Engineer.
2. Piping shall be installed as straight and direct as possible forming right angles or parallel lines with building walls, other piping and neatly spaced.
3. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.
4. Piping or other apparatus shall not be installed in such a manner so as to interfere with the full swing of the doors, windows and access to other equipment.
5. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect/Engineer to change locations and elevations to accommodate the work, without additional compensation for such change.
6. It shall be possible to drain the water from all sections of cold-water piping system. Pitch piping back to drain valves.
7. Screwed piping of brass or chrome plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.
8. Small fittings shall be screwed up close to the shoulders of male threads. Lampwick, cord, wool, or any other similar material shall not be used to make up thread joints.
9. Screwed pipe and copper tubing shall be reamed smooth before installation.
10. All exposed piping in connection with fixtures and where exposed on finished walls or to view, shall be chrome plated. Where chrome plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when the work is completed.
11. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.
12. Remove and replace with new materials, any copper or brass piping (chrome plated or unplated) and valves showing visible tool marks.

13. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.
14. Any piece of pipe six inches or less in length shall be considered a nipple.
15. All water service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than I inch from other work.
16. The pipe and fittings shall be manufactured in the United States of America and in accordance with the Commercial Standards, American National Standards Institute and American Society of Testing Materials.

B. Hanger Installation

1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
2. Maximum spacing of hangers on runs of pipe (vertical and horizontal) having no concentration of weight shall be as follows:

SCHEDULE			
MATERIAL	Steel	Copper	PVC
Pipe Size (inches)	Hanger Spacing in Feet/Pipe		
.50		6	
.75		6	
1.00		6	
1.25		10	
1.50		10	
2.00		10	
2.50		10	
3.00		10	
3.50		10	
4.00		10	
5.00			
6.00			
8.00			

3. Friction clamps shall be installed at the base of the plumbing risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.
4. Provide hangers at a maximum distance of two feet from both sides of all changes in direction (horizontal and vertical), on both sides of concentrated loads (equipment) and at valves.
5. Hangers, in general, for all horizontal piping shall be A Band type hangers for piping up to 4' size. These hangers shall be sized to fit the outside

diameter of the pipe insulation protectors (sheet metal shields) specified herein. Gang type hangers may be used for supply piping up to 3" size where applicable and in conformance with manufacturer's recommendations.

6. All vertical drops and runouts including insulated pipes shall be supported by split ring hangers with extension rods and wall plates or stamped type up to 2" size only.
7. Provide on all horizontal insulated lines, pipe covering protectors (shields) at each hanger. Each protector shall be sized to fit the outside diameter of the Pipe insulation.
8. Lock nuts or retaining straps shall be provided with all beam clamps.
9. All supplementary steel including factory fabricated channels and associated accessories, including 12-inch-long sheet metal shields, throughout both suspended and floor mounted shall be provided by this Contractor and shall be subject to the approval of the Architect/Engineer.
10. Hangers shall not pierce the insulation on any insulated pipe except when prior approval is given.
11. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
12. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of galvanized paint immediately after erection.
13. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping and equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.
14. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.
15. Installation of hangers which permit wide lateral motion of any pipe will not be acceptable.
16. All hangers in contact with un-insulated piping shall be compatible with piping material.

C. Installation of Sleeves, Inserts and Escutcheons

1. Sleeves in floors shall set one (1) inch above the finished floor surface or as indicated on the Architectural Drawings.
2. Sleeves through interior masonry or non-masonry walls or partitions shall be set flush with the finished surfaces of the wall or partition.
3. Field drilling for inserts required for work under this section of the specifications shall be provided by the Plumbing Contractor.
4. Each interior wall or floor sleeve shall be firestopped to provide equivalent fire resistance to floor or wall penetration. Each sleeve penetration thru the slab on grade shall be made gas tight.

5. Escutcheons shall be installed around all exposed insulated or bare pipe, passing through a finished floor, wall or ceiling. Escutcheons shall fit snugly around the bare or insulated pipe. Escutcheons shall be chrome plated cast brass at fixture supplies and traps where exposed. Spun bell type escutcheons in these locations are unacceptable.
- D. Valve Installation: There shall be valves where indicated on the drawings and where specified as follows:
1. At building service entrances, all supply risers, branches to groups of fixtures, branches to separate fixtures, equipment, connections to other systems and sectionalizing points in each system.
 2. Each piece of equipment shall have isolation valves for each service connected or at inlet and outlet of equipment with single service.
 3. At the low points of each water system including trapped sections, provide a tee with 1/2-inch branch and ball valve with 3/4-inch hose end vacuum breaker and attached chain with cap.
 4. Valves shall be located to permit easy operation, replacement or repairs.
 5. Provide access panels where valves would otherwise be inaccessible.

3.10 PIPE COVERING INSTALLATION

- A. Before pipe covering is applied, all pressure tests shall have been performed and approved.
- B. Pipe covering shall be applied over clean, dry surfaces.
- C. Pipe covering shall be continuous and shall be carefully fitted with side and end joints butted firmly and tightly together finished as specified herein.
- D. Pipe covering and auxiliaries shall be kept dry during storage and application.
- E. Adhesives, and coatings shall not be applied when the ambient temperature is below 40 degrees Fahrenheit.
- F. Valve bodies shall have covering applied up to the stem.
- G. It is the intent of this Specification that all vapor barriers be sealed and be continuous throughout. Staples shall not be used on vapor barrier jackets.
- H. Where pipe covering ends occur at equipment or fixtures, end caps on the covering shall be provided.
- I. Adequate operating clearances shall be provided at control mechanisms.
- J. Pipe covering for flanges shall overlap the adjoining pipe by a minimum of three inches on each side.

- K. Pipe covering shall be provided on all piping passing through ceilings and through the interior above ground sleeves (wall and floor).
- L. All voids and or seams in insulation shall be filled with insulating cement and finished as specified herein.
- M. In the event staples are used, they shall be coated with a vapor barrier mastic after insulation and taped. These staples shall not be visible on finished installation.
- N. Staples are not permitted on domestic hot water applications.
- O. End joints of each section of the installed pipe covering shall be tightly butted.

3.11 EQUIPMENT

- A. Equipment shall be installed complete with all required hangers and supports in accordance with the manufacturer's recommendations.
- B. All equipment provided under this Section shall be installed in strict accordance with manufacturer's written installation instructions.
- C. Furnish and install all steel structural support members for proper hanging and support of equipment. Provide vibration isolation on all hangers.

END OF SECTION

DIVISION 23

HVAC

SECTION 23 00 00

HVAC

Filed Sub-Bid Required

HVAC

PART 1 - GENERAL

1.01 FILING SUB-BIDS

- A. HVAC is stipulated as a filed Sub-Bid under Part B, Item 2 of the form for GENERAL BID.
- B. All sub-bids shall be submitted on the form for SUB-BID furnished by the Awarding Authority, as required by Section 44F of Chapter 149 of the General Laws, as amended.
- C. Sub-Bids must be filed with the Awarding Authority in a sealed envelope, before twelve o'clock noon, local time, on the date stipulated in the Advertisement.
- D. Specific information relating to sub-bidders is set forth in the Contract Documents, under the heading "NOTICE TO ALL BIDDERS, Including Sub-bidders" and the attention of sub-bidders is directed thereto.
- E. Additional Requirements: Sub-bidder's attention is directed to Massachusetts G.L. Chapter 149 §44H, as amended, which provides in part as follows:

- 1. Each sub-bidder shall list in Paragraph E of the "Form for Sub-bids" the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the Section of the Specifications for that sub-trade requires such listing, provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list his own name or part thereof and perform that work with persons on his own payroll, if such sub-bidders, after sub-bid openings, shows to the satisfaction of the Awarding Authority that he does customarily perform such class of work with persons on his own payroll and is qualified to do so. This Section of the Specifications requires that the following classes of work shall be listed in Paragraph E under the conditions indicated herein.

<u>Classes of Work</u>	<u>Reference Specification</u>	<u>Reference Paragraphs</u>
Sheet Metal Work	23 00 00	2.04, 2.05, 2.06, 2.07, 3.04, 3.08
Automatic Temp. Controls	23 00 00	2.13, 3.12

- F. The work to be done under this SECTION 23 00 00 - HVAC is shown on the drawings numbered: H0.1, H0.2, H0.3, H1.1 & H2.1.

1.02 RELATED DOCUMENTS

- A. Drawings, PART A and DIVISION 1 of PART B are hereby made a part of this SECTION 23 00 00.
- B. Examine all drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.03 SCOPE OF WORK

- A. The work covered by this Section of the Specifications consists of furnishing all labor, equipment, appliances, and materials, and in performing all operations in connection with the installation of all systems, complete, in accordance with these Specifications and drawings, and subject to the terms and conditions of the contract.
- B. The following work is specifically included without limiting the generality implied by these Specifications:
1. Demolition of existing HVAC equipment, ductwork, piping, automatic temperature controls and appurtenances
 2. Coordination of scope and existing services to remain as indicated
 3. Reconnection, balancing and start-up of existing equipment to remain
 4. HVAC Duct cleaning – All Existing Ductwork and Flues to Remain
 5. Hydronic Piping, Fittings and Accessories
 6. Valves
 7. Convectors
 8. Exhaust Fan
 9. Registers and Grilles
 10. Sheet Metal Ductwork and Accessories
 11. Duct, Piping and Equipment Insulation
 12. Louvers
 13. Access panels (furnishing only)
 14. Automatic Temperature Controls
 15. Cleaning, testing and balancing
 16. Systems shall be complete, including all appurtenances for fully workable systems.
- C. Provide any other component or related system (whether or not listed) which is part of the overall design and basic equipment and deemed necessary for its completion, thoroughness and readiness for operation in perfect condition.

- D. All electrical apparatus and controls furnished as a part of the HVAC work shall conform to applicable requirements under DIVISION 26 00 01 ELECTRICAL.
- E. All work shall be coordinated with the Construction Schedule.

1.04 RELATED WORK

- A. Work related to this Section which will be executed by other Contractors under other Sections includes:
 - 1. Power wiring and disconnect switches.
 - 2. Flashing of curbs through roof.
 - 3. Flashing of wall penetrations.
 - 4. Installation of access panels.

1.05 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION

- A. Install duct-mounted smoke detectors furnished by the Electrical subcontractor. The HVAC Subcontractor shall wire the appropriate fan to shut down upon detection of smoke. The Electrical Subcontractor shall furnish, power wire, and wire the smoke detector to the fire alarm panel.

1.06 CODES, ORDINANCES, AND PERMITS

- A. Installation of systems and equipment provided under this section shall be done in strict accordance with Massachusetts Department of Public Safety Codes, Massachusetts Department of Environmental Protection, Massachusetts State Building Code and Boston Regulations having jurisdiction.
- B. All work, where applicable, shall conform to NFPA codes and all material shall be U.L. approved.
- C. All electrical apparatus furnished under this section shall be approved by the U.L. and shall be so labeled or listed where such is applicable. Where custom-built equipment is specified and the U.L. label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by U.L. where such is applicable to the component.
- D. Give notices, file plans, obtain permits and licenses, pay fees and obtain necessary approvals from authorities having jurisdiction. Deliver certificates of inspection to Engineer. No work shall be covered before examination and approval by Engineer, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work conforming to requirements, satisfactory to Engineer, and without extra cost to the Owner. If work is covered before due inspection and approval, the installing contractors shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

1.07 CLEANING

- A. During the progress of the heating, ventilating and air conditioning work, clean up and remove all oil, grease and other debris caused by this work. At completion, clean all equipment, piping and duct systems and leave all work in perfect operating condition.

1.08 RESPONSIBILITY

- A. The structure and its appurtenances, clearances and the related services, such as plumbing, heating, ventilation and electric service have been planned to be legal, adequate and suitable for the installation of equipment specified under this section. The Owner will not assume any increase in cost caused by differing requirements peculiar to a particular make or type of equipment, and any incidental cost shall be borne by this Contractor. He shall be responsible for the proper location of his required sleeves, chases, inserts, etc., and see that they are set in the forms before the concrete is poured. He shall be responsible for his work and equipment furnished and installed by him until the completion and final acceptance of this contract, and he shall replace any work which may be damaged, lost or stolen, without additional cost to the Owner.

1.09 PROTECTION OF MATERIALS, WORK, AND GROUNDS

- A. Materials, fixtures and equipment shall be properly protected and all pipe and duct openings shall be temporarily closed so as to prevent obstruction and damage.
- B. Protect and preserve all materials, supplies and equipment of every description and all work performed. Protect all existing equipment and property of any kind from damage during the operations. Damage shall be repaired or replaced promptly by the Contractor at his expense.

1.10 BASES AND SUPPORTS

- A. Furnish and install all supplementary steel required for setting and/or hanging all piping and equipment.
- B. Whenever necessary, provide all bases and supports not part of the building structure, of required size, type and strength, as approved by the Engineer or Architect, for all equipment and materials furnished by him.

1.11 DRAWINGS

- A. The drawings show the extent and general arrangement of piping, ductwork and locations of the equipment. Ductwork is shown diagrammatically. Be responsible for location and work in the most practical manner, free from

interference's with other piping or structural features. If any changes from the drawings are deemed advisable, details of such proposed changes shall be submitted to the Architect for approval. No changes shall be made without such approval. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, Architect shall be notified before proceeding with the installation.

- B. The drawings are, in general, made to true scale but all working measurements shall be taken from figured dimensions and not by scaling. Whether or not an error is believed to exist, deviations from the drawings and dimensions thereon shall be made only after approval is obtained from the Architect. Large scale details shall, in general, govern the smaller scale drawings.
- C. Compare all drawings affecting the work and verify all figures before laying out the work. Be responsible for any and all errors in work, which might have been avoided thereby. When dimensions are affected by conditions already established, take all necessary measurements of existing work, notwithstanding the figured dimensions or the drawings coordinate reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

1.12 EQUIPMENT SUBMITTALS

- A. Submit for approval copies of descriptive literature giving performance data, physical size, wiring diagrams, capacity, material, etc., for all items listed, including but not limited to the following:
 - 1. Sheet Metal Ductwork and Accessories
 - 2. Piping, Each Type
 - 3. Insulation, Each Type
 - 4. Registers, Grilles and Diffusers
 - 5. Convectors
 - 6. Exhaust Fan(s)
 - 7. Louver(s)
 - 8. Hangers, Supports, Anchors, Guides, Sleeves and Miscellaneous Steel
 - 9. Vibration Isolation
 - 10. Water Treatment
 - 11. Fire Stopping
 - 12. Automatic Temperature Controls components complete with wiring diagrams
 - 13. HVAC Equipment Sequence of Operation
 - 14. Testing and Balancing of Hydronic and Air Systems

1.13 SUBSTITUTIONS

- A. Substitutions of equipment or materials other than those shown on the drawings or named in the Specifications may be made only with the written approval of the Engineer who reserves the right to require adequate proof of the quality of the substitute before permitting its use in accordance with Division 1 of these specifications.
- B. Where a contractor proposes to use an item of equipment other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundations, wiring, piping, or of any other part of the mechanical, electrical, or architectural layout, all such redesign and all new drawings and detailing required therefore shall, with the approval of the Architect, be prepared by this Contractor at his own expense.
- C. Where such approved deviation requires a different quantity and arrangement of ductwork, piping, wiring, conduit and equipment from that specified or indicated on the drawings, with the approval of the Architect, Contractor shall furnish and install any such ductwork, piping, structural supports, insulation, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

1.14 GUARANTEE

- A. Guarantee that all work installed will be free from any and all defects in workmanship and/or materials and that all apparatus will develop capacities and characteristics specified.
- B. If, during a period of one year from the date of final completion and acceptance of the work, any such defects in workmanship, material or performance appear, he will, without cost to the Owner, remedy such defects within a reasonable time to be specified in notice from the Architect. If Contractor uses equipment during the course of the project, the equipment shall be inspected and certified prior to final acceptance; Contractor shall not commence until final acceptance by the owner.
- C. Provide all refrigeration compressors with the manufacturer's extended replacement warranty for a total of five years. All warranties must have been submitted prior to Final Payment.
- D. Correct all damage to insulation, paint or building caused by defects in his work, equipment, and its operation. Guarantee shall include startup, shutdown, maintenance, and 24-hour service during the guarantee period.
- E. Any apparatus that requires excessive service during the warranty period will be considered defective and shall be replaced.

1.15 RECORD DRAWINGS

- A. Maintain at the job site at all times a complete set of black line prints and mark accurately, clearly and completely the actual installation in accordance with the requirements of this Section. At the completion of the contract, prepare at no extra cost a set of reproducible record drawings and submit to the owner.

1.16 ELECTRIC WORK

- A. All electrical apparatus and controls furnished as a part of this Section shall conform to applicable requirements under DIVISION 26 - ELECTRICAL.
- B. All motors furnished under this Section shall be furnished by the manufacturer of the equipment served shall be of the highest efficiency type available and shall be mounted and aligned so as to run free and true. Each motor shall be built to conform to the latest applicable NEMA, ANSI and IEEE standards for the type and duty of service it is to perform.
- C. Each motor shall be designed to operate on 60 Hz, and each shall be expressly wound for the voltage specified. Each motor shall operate satisfactorily at rated load and frequency with a voltage variation no greater than plus or minus 10 percent of voltage specified. Dual voltage 208/220 motors will not be accepted.
- D. All motors shall be provided with adequate starting and protective equipment and each shall have a terminal box of adequate size to accommodate the required conduit and wires.
- E. Motor starters shall be equipped with all poles, auxiliary contacts and other devices necessary to permit the interlocking and control sequences required. Controller operating coils shall be generally designed for 120 volt operation, and 3 phase motors shall be provided with thermal overload protection in all phases.
- F. Furnish all magnetic starters for each and every motor furnished under this section of the specification, except where otherwise indicated. The Electrical Sub-Contractor shall install and wire the starter. Provide disconnects for all fans including exhaust fans and rooftop units.
- G. Furnish and install all low voltage and/or line voltage control wiring for HVAC equipment. All wiring shall be installed by a licensed electrician.

1.17 INSTRUCTIONS TO THE OWNER

- A. All mechanical equipment installed in connection with this Section shall be put in operation in the presence of duly authorized representatives of the Owner. Instructions and training shall be given to the Owner's employee appointed to

familiarize himself with the systems and equipment. Three copies of the operating manual, parts list, and bulletin shall be delivered to the Owner.

- B. The Manual shall include the following:
 - 1. Summary description of the system's operation.
 - 2. Manufacturers' literature, illustrations, and technical data.
 - 3. Guarantee and warranty data.
 - 4. Parts list and parts numbers.
 - 5. Maintenance, lubrication, and replacement charts.
 - 6. Trouble shooting charts.

1.18 COORDINATION OF TRADES

- A. Give full cooperation to other trades and shall furnish (in writing, with copies to the Architect) any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
- B. Where the work will be installed in close proximity to work of other trades, or where there is evidence that the work will interfere with work of other trades, assist in working out space conditions to make a satisfactory adjustment. Prepare composite working drawings and sections at a suitable scale designated by the Architect clearly showing how the work is to be installed in relation to the work of other trades. If this Contractor installs his work before coordinating with other trades, or so as to cause interference with work of other trades, he shall make necessary changes in his work to correct the condition without extra charge.

1.19 INSPECTION OF SITE

- A. Prior to submitting his bid, visit the site and inspect conditions affecting the proposed work. Failure to visit the site and misinterpretation of the drawings and specifications resulting there from shall be entirely the responsibility of the bidder. No claims based on lack of knowledge or difficulties resulting from same shall be allowed.

1.20 COORDINATION DRAWINGS

- A. Coordinate use of project space and sequence of installation of plumbing, HVAC and electrical work.
- B. Allow cutting of structural elements only in locations and by methods approved by the structural engineer.
- C. Prepare coordination drawings showing ductwork, piping, lights, etc. prior to commencement of work. Submit drawings to the Engineer for review and approval.

1.21 UNDERWRITERS' LABEL AND LISTING

- A. All electrical apparatus furnished under this Section shall be approved by the UL and shall be labeled or listed where such is applicable. Where custom-built equipment is specified and the UL label or listing is not applicable to the completed product, all components used in the construction of such equipment shall be labeled or listed by UL where such is applicable to the component.

1.22 CUTTING AND PATCHING

- A. All cutting and patching for openings less than one (1) square foot in area that necessary for the proper installation of work to be performed under this Section and subsections shall be performed by the HVAC Contractor.
- B. All work shall be fully coordinated with all phases of construction to minimize the requirements for cutting and patching.
- C. Form openings for the installation of his own or any other Contractor's or Subcontractor's work and shall see that all sleeves or forms are in the work and properly set in ample time to prevent delays. He shall see that all such chases, openings, and sleeves are located accurately and are of the proper size and shape and shall consult with the Engineer and the Contractors or subcontractors concerned in reference to this work. In so doing, he shall confine the cutting to the smallest extent possible consistent with the work to be done. In no case shall piers or structural members be cut without the approval of the Engineer.
- D. Carefully fit around, close up, repair, patch, and point around the work specified herein that is less than one square foot in area to the entire satisfaction of the Engineer.
- E. All of this work shall be carefully done by workmen competent to do such work and with the proper and smallest tools applicable.
- F. Any cost caused by defective or ill-timed work shall be borne by this contractor responsible therefore.

1.23 STANDARDS

- A. The latest published issue of the standards, recommendations, or requirements of the following listed societies, associations, or institutes in effect at the date of Contract are part of this Specification. These shall be considered as minimum requirements; specific requirements of this specification and/or associated drawings shall have precedence. In case of conflict between published requirements, the Owner's representative shall determine which is to be followed.

- 1. AMCA Air Moving and Conditioning Association

- | | | |
|-----|--------|---|
| 2. | ANSI | American National Standards Institute |
| 3. | ASHRAE | American Society for Heating, Refrigerating, and Air Conditioning Engineers |
| 4. | ASME | American Society of Mechanical Engineers |
| 5. | ASTM | American Society for Testing and Materials |
| 6. | FIA | Factory Insurance Association |
| 7. | IEEE | Institute of Electrical and Electronic Engineers |
| 8. | MCAA | Mechanical Contractors Association of America |
| 9. | NEMA | National Electrical Manufacturers Association |
| 10. | NFPA | National Fire Protection Association |
| 11. | SMACNA | Sheet Metal and Air Conditioning Contractors' National Association |
| 12. | UL | Underwriters' Laboratories, Inc. |
| 13. | OSHA | Occupational Safety and Health Act |
| 14. | NEC | National Electric Code |

1.24 FINAL ACCEPTANCE

- A. Final acceptance of Ownership of the HVAC system installed within this scope of work shall be contingent on passing a satisfactory system pressure test, mechanical performance test and cooling and heating function test to determine that the system will perform according to the contract requirements. The above tests shall be witnessed by the Engineer and the Owner at his option and acceptance will only be granted in writing by the Owner after receipt of certification from the Engineer that the design criteria have been met.

PART 2 - PRODUCTS

2.01 PIPE HANGERS, SUPPORTS, INSERTS

- A. Carpenter and Patterson, Grinnell, Calco, or approved equal. Figure numbers listed are Carpenter and Patterson numbers.
- B. General: Piping systems shall be supported in accordance with ANSI B31.1 so as to maintain required pitch of lines, prevent vibration, and provide for expansion and contraction movement.
- C. Piping hangers and supports shall be furnished and installed for piping. Provide all components (i.e., inserts, rods, clamps, hangers, washer, lock nuts, rollers, etc.) necessary for a complete installation.
- D. Hangers:
1. Hangers for all hot water supply and return piping shall be Figure 100SH refrigeration hanger and shield.
 2. Hangers for all other piping shall be Figure 1A Bands.

3. All hangers shall be with supporting rods and nuts. Rod sizes shall be 3/8".
4. Pipe covering protection saddles shall be Series 350 galvanized steel and shall be furnished for installation at each hanger where pipes are insulated.

E. Upper Attachments to Building Structure:

1. Reinforced Concrete Construction: Upper attachment welded or clamped to steel clip angles which are expansion-bolted to the concrete. Expansion bolting shall be located so that piping loads place bolts in shear.
2. Structural Framing: Upper attachments welded or clamped to structural steel members. Additional steel members may be necessary in some support locations where piping locations differ from that known on contract drawings.
3. Submit details for approval.

- F. Expansion Fasteners and Power Set Fasteners: In concrete ceiling construction, expansion fasteners may be used for hanger loads up to one-third the manufacturer's rated strength of the expansion fastener. Power set fasteners may be used for loads up to one-fourth of rated load. When greater hanger loads are encountered, additional fasteners may be used and interconnected with steel members combining to support the hanger.

2.02 SLEEVES

- A. Furnish pipe sleeves for all pipes which pass through masonry floors and walls. Sleeves shall be Schedule 10 steel pipe. Sleeves shall be of the first possible size larger than the outside of the insulation jacket on covered piping and the first possible size larger than the outside of the piping on uncovered pipes.
- B. Sleeves shall be of sufficient length so as to be flush on either side of masonry walls, flush on underside of masonry floor and extend 2" above the finished floor.

2.03 ESCUTCHEON PLATES

- A. Escutcheon plates shall be chromium plated, cast brass split type escutcheons.

2.04 SHEET METAL DUCTWORK

- A. Sheet metal work shall be fabricated and installed in accordance with the applicable recommendations for the "Duct Manual and Sheet Metal Construction for Ventilation and Air Conditioning Systems" published by the National Association of Sheet Metal and Air Conditioning Contractors and shall be in compliance with the State Building Code.

- B. Provide turning vanes and volume dampers where shown and where necessary to regulate air volume. Vanes shall be double wall. Volume dampers shall be single or multiple blades including arm & wing nut.
- C. All joints in ductwork shall be sealed with duct sealer to prevent leakage. Sealer operational temperature shall be -20°F to 150°F and application temperature shall be 0°F to 120°F . Sealer shall be stored at room temperature for 24 hours before use. Install per manufacturer's recommendations.
- D. Flexible connections shall be provided at both intake and discharge of air handling units and fans. Exterior flexible connection shall be weathertight.
- E. Sheet metal ductwork shall be fabricated from galvanized steel for supply and return air ductwork of lock forming quality. All new exhaust air ductwork shall be aluminum. Ductwork gauges shall be in accordance with the latest edition of SMACNA.
- F. Longitudinal duct seams shall be Pittsburgh lock type. Transverse joint shall be secured with sheet metal screws or bolts, no button punching will be allowed.
- G. Branches to and from the main trunk shall be made at an angle not to exceed 45° to the line of the main trunk. Changes in size shall be made with tapered connection approved by the Engineer but shall in no case exceed 30° to the line of air flow. For all changes in direction where the center line radius is less than 1-1/2 time the width of the duct, turning vanes shall be provided. These shall be double vane type.
- H. Ductwork shall be rigidly supported and secured to a substantial portion of the building's construction reinforced and braced as necessary to be free from vibration, rattle and noise. Hangers shall be galvanized and securely suspended from the building. Drilling of structural steel will not be permitted.
- I. Splitter and volume dampers shall be two gauges heavier than the ducts in which they are installed. Damper blades shall be riveted to the supporting rod. Cast or malleable brackets riveted to the side of the ducts shall be used to support the damper rod. Splitter dampers shall be sufficiently long to extend the full width of the branch duct to which attached.
- J. Fire dampers shall be constructed and installed in accordance with the standards of the NBFU, shall be UL labeled as manufactured by Ruskin, Phillips, Air Balance, Prefco Co, or approved equal. Fire dampers shall be installed at every duct penetration of fire rated walls or floors.
 - 1. Unless otherwise noted, all duct and fittings shall be G-90 galvanized steel in accordance with ASTM A-653 and A-924.

2. Unless otherwise noted, all duct and fittings shall be constructed per SMACNA's Duct Construction Standards (+10 in W.G.) shown in the following table:

Diameter (inches)	Galvanized Spiral Duct	Galvanized Fittings
3 -14	26	24
16-26	24	22
28-36	22	20
38-50	20	20

3. Fittings:
- a. The radius of all 90 degree and 45-degree elbows shall be 1.5 times the elbow diameter, unless otherwise noted on the contract document to be 1.0. The radius of all 15-degree, 30 degree, and 60-degree elbows shall be 1.0 times the elbow diameter.
4. Performance: Duct system performance shall meet SMACNA's leakage Class 3 requirements at the system design static pressure as indicated on the contract documents not to exceed -20 in W.G. or +12 in W.G.

- K. Insulated Metal Panels: Provide 22 gauge, insulated double wall sandwich construction, 1-1/2" thick where called for on the Drawings and for blanking off unused portions of wall louvers Metal Panels shall be finished and painted on both sides.

2.05 DUCTWORK ACCESSORIES

A. Manual Volume Dampers

1. Manual volume dampers shall be provided where shown on the Drawings at every branch take off from the main duct, and elsewhere as required by the Balancing Contractor, and shall be single or multiple blade type with sleeve bearings, galvanized steel interlocking blades and a galvanized steel frame. In ducts over 15" deep provide multiple opposed blade type, gang operated dampers with a maximum blade width of 8". Damper blades shall be fabricated of 16-gauge steel with hemmed edges, and a maximum length of 48". Damper operating rod shall be full blade length extended through the duct to externally mounted bearing plates. On insulated ductwork, bearing plates shall be installed flush with insulation finish and fastened to the duct. Operating lever shall be of the indicating type with locking quadrant.

B. Barometric Dampers

1. Barometric back draft dampers shall be provided where indicated and required, and shall consist of a set of adjustable counter weighted louvers that open automatically due to excess pressure. The edges of the blades shall be provided with felt strips to prevent rattling and air leakage. The damper blades shall be supported on metal frames designed for wall mounting as indicated. The dampers shall be standard catalog products of Air Balance, Inc., Penn Ventilator, E. Van Noorden Company or approved equal.

C. Relief Dampers

1. Relief dampers shall be provided where indicated and required, and shall consist of a set of adjustable counter weighted louvers that open automatically due to excess pressure. The edges of the blades shall be provided with felt strips to prevent rattling and air leakage. The damper blades shall be supported on metal frames designed for wall mounting as indicated. The dampers shall be standard catalog products of Air Balance, Inc., Penn Ventilator, E. Van Noorden Company or approved equal.

D. Fire Dampers

1. Provide fire dampers at all fire walls and floors, where required by Code and as indicated. Fire damper construction and installation shall meet the requirements of the NFPA 90A, and shall be UL labeled, tested and inspected in accordance with UL 555. Fire dampers shall be as manufactured by Air Balance, Inc., Penn Ventilator Company, Ruskin or approved equal.
2. An access door shall be provided at each damper to service and inspect the fusible link.
3. Ducts shall be enlarged where fire dampers are installed to maintain the same free area through the damper as in the duct run. Provide all required sleeves, angles, and connectors as detailed on the Drawings.

E. Combination Fire Smoke Dampers

1. Combination fire smoke dampers shall be furnished and installed at the locations shown on the plans and shall meet or exceed the following criteria:
 - a. Requirements of NFPA90A, 92A and 92B
 - b. 3-hour fire rating in accordance with UL 555
 - c. Classified as Leakage Class I Smoke Damper in accordance with UL 555S
 - d. AMCA licensed and rated for air performance
 - e. Minimum temperature rating of 250°F or 350° for dampers and actuators in accordance with UL 555S

2. Each fire smoke damper shall be equipped with a "controlled closure" quick detect heat-actuated release device. Instantaneous damper closure through the use of fusible links is unacceptable.
3. Damper frame shall be constructed of a roll-formed structural hat channel, reinforced at the corners, formed from a single piece of minimum 16 gage (1.6) galvanized steel.
4. Damper blades shall be airfoil shaped with 13 gage (2.3) equivalent thickness formed from a single piece of galvanized steel.
5. Bearings shall be stainless steel turning in an extruded hole in the frame.
6. Blade edge seals shall be silicone rubber and galvanized steel mechanically locked in to the blade edge (adhesive type seals are not acceptable).
7. Each damper shall be supplied with a factory mounted sleeve of 17" (432) minimum

F. Volume Extractors

1. Shall be manufactured by the drum louver or supply air register manufacturer of all aluminum construction. Position adjustment operator shall be key-operated screw with access through face of register. Extractor blades shall be spaced 1" on center.

G. Blank-off Plates

1. Any blank-off plates or conversions required for mounting control dampers or coils shall be the responsibility of the Sheet Metal Sub subcontractor.

H. Insulated Metal Panels

1. Provide 18 gauge, insulated double wall sandwich construction, 1½" thick where called for on the Drawings and for blanking off unused portions of wall louvers.

I. Access Doors

1. In ductwork up to 2" pressure class.
 - a. Frame: 24-gauge galvanized steel with seal
 - b. Door: hinged, with 24-gauge galvanized steel exterior and interior panels.
 - c. Locks: doors 16" and under, one lock doors over 16", two locks
 - d. Seals: foam gasket

2.06 REGISTERS, GRILLES & DIFFUSERS

- A. Registers shall be manufactured by Titus Mfg. Co., Metal-Aire, T&B, or approved equal. Each register shall include sponge rubber gasket and baked enamel, off-white finish. Provide opposed blade dampers on all sidewall and ceiling mounted registers and air scoops on all duct mounted registers.
- B. Supply Registers: Heavy gauge aluminum or steel construction with 1-1/4" overlap margin, countersunk screw holes and mounting screws. Supply registers shall adjustable vertical face bars, 3/4-inch on center with rear diffusing vanes. Provide with integral opposed blade damper designed for screwdriver operation.
- C. Return/Exhaust Registers: Heavy gauge aluminum or steel construction with 1-1/4" overlap margin, countersunk screw holes and mounting screws. Return/exhaust registers shall have horizontal face bars fixed at 40-degree angle, with bar spacing of 3/4" on center.
- D. Provide diffuser frame type (lay-in, surface mount, snap-in or spline) to match ceiling type.
- E. The right is reserved to vary the dimensions and locations of registers to a reasonable extent as necessary as the work progresses.

2.07 LOUVERS

- A. Furnish and install stationary louvers of the sizes as shown on the Contract Drawings.
- B. The fixed wall louvers shall have heads, sills, jambs and mullions of one (1) piece structural members of 6063-T52 alloy, 0.125 inch (3.18 mm) thick with integral caulking slot and retaining beads. Mullions shall be sliding interlock type with double integral internal drains. Drainable blade to be minimum 0.081 inch (2.06 mm) thick with front lip gutter and recessed second gutter designed to catch and direct water to jamb and mullion drains. Closed cell PVC compression gaskets to be provided between bottom of mullion or jamb and top of sill to insure leak tight connections. Structural supports to be designed to carry a wind load of not less than thirty (30) pounds per square foot. All fasteners to be stainless steel or aluminum. All louvers shall be furnished with aluminum mesh insect screen. Screening shall be replaceable.
- C. Manufacturer to submit AMCA500 test data on a 4-foot x 4-foot unit showing that the louver shall pass less than 0.005 ounces per square foot of free area at 1100 FPM free area velocity with a pressure drop of less than 0.24 inches w.g. AMCA data shall also show a 4-foot x 4-foot unit to have a minimum of 8.0 square feet free area.
- D. Louvers shall be finished with baked acrylic enamel paint, containing minimum 50% Kynar. Submit color chips to Architect for approval.

HEATING, VENTILATING AND AIR CONDITIONING

- E. Louvers shall be Ruskin Model ELF 6375D, Louvers and Dampers Model IEL, Construction Specialties Model 6097, or equal

2.08 HYDRONIC PIPING AND FITTINGS

- A. Furnish all pipe and fittings required for the HVAC systems, including hot water supply (HWS), hot water return (HWR), drain (D), and cold-water make-up piping.
- B. All hot water supply (HWS) and hot water return (HWR), piping 2-1/2" and larger shall be Schedule 40 seamless black steel pipe and shall conform to ANSI B-36.10 and ASTM A-53, grade A or B. All piping 2" and below shall be Type L hard drawn copper, ASTM B88 with 95/5 solder fittings, Schedule 40 seamless steel welding fittings.
- C. Unions for use with steel piping shall be 300-pound malleable iron, ground joint, or 2,000-pound forged steel, 600 psi WOG, sweat or thread end as required. Unions for copper pipe shall be bronze, ground joint, 600 psi WOG, sweat or thread end as required.
- D. Drain (D) and Cold-water make-up piping shall be Type L hard drawn copper, ASTM B88 with wrought copper ANSI B16.22 fittings. Joints shall be soldered, ASTM B32, with 95/5 solder.
- E. Provide dielectric unions at all connections of dissimilar metals. Dielectric unions shall be factory certified to withstand a minimum of 600 volts on a dry line with no flashover, rated 250 psig and conforming to ANSI B16.39. Dielectric union and flange pipe threads shall conform to ANSI B2.1.

2.09 HYDRONIC VALVES & SPECIALTIES

- A. Gate valves, globe valves, check valves and drawoff valves shall be Powell, Lunkenheimer, Crane, or approved equal. Figure numbers herein are Powell numbers.
 - 1. Gate valves 2-1/2" and larger shall be Figure 1793, 125#, I.B.B.M., solid wedge, O S & Y, rising spindle, flanged end.
 - 2. Globe valves 2-1/2" and larger shall be Figure 241, 125#, I.B.B.M., O S & Y with regrind - renew beveled bronze disc and seat ring, flanged end.
 - 3. Check valves 2-1/2" and larger shall be Figure 559, 125#, I.B.B.M., horizontal swing type, with regrind-renew bronze seat ring and disc, flanged end.
 - 4. Check valves 2" and smaller shall be Figure 578, 125# bronze, horizontal swing type with regrinding bronze seat and disc, screwed end.
 - 5. Draw-off valves shall be Figure 503H, bronze, screwed inlet, hose outlet.

- B. Balancing valves shall be Taco Model CS, Bell & Gossett, Armstrong, or approved equal, circuit setter
 - 1. Ball valve construction, Teflon seats, calibrated nameplate, Schrader valve connections, cast bronze.
- C. Valves 2" and smaller shall be ball valves. Ball valves shall be Jenkins Figure 32-A, Crane, Stockham or approved equal, bronze ball valves with bronze ball, Teflon seats, brass stem and cadmium plated steel handle with plastic grips.
- D. Pressure-reducing Valves
 - 1. Bell and Gossett, Armstrong, Taco or equal.
 - 2. Diaphragm operated pressure-reducing valve with low inlet pressure check valve and inlet strainer. The strainer shall be easily removable without system shutdown. The valve seat, strainer and stem shall be removable and of non-corrosive material. The body shall be brass. The valve shall be full line sized as shown on the Drawings. Pressure setting to be minimum system operating pressure.
- E. Multi-Purpose Pump Discharge Valves (furnish at the discharge of all hydronic heating pumps)
 - 1. Bell and Gossett, Armstrong, Taco or Equal
 - 2. Valves to be designed to permit tight system shutoff and then return to original balance point after shutdown, to perform as a spring-loaded non-slam check valve and to perform as a plug-type flow control valve. Valve to be able to be repacked under full pressure. Valve to be suitable for use in heating systems with working temperatures up to 230 ° F.
 - 3. Valve to have flanged, ductile-iron body, bronze disc and seat, stainless steel stem and spring. Valve body to be furnished with two 1/4" plugged drain tappings.
 - 4. Valves shall be equipped with Schrader valve metering connections to facilitate differential pressure readings across the valve orifice for accurate system balancing.
 - 5. Each valve to be furnished with a pre-formed removable PVC insulation jacket with high density fiberglass insulation suitable for temperatures up to 230 ° F continuous.
- F. Combination Balancing/Shutoff Valves: Furnish and install circuit balancing valves as shown on plans and in accordance with the manufacturer's installation instructions.
 - 1. Each valve shall have two 1/4" NPT brass metering ports with Nordel check valves and gasketed caps located on both sides of valve seat. Two additional 1/4" NPT connections with brass plugs are to be provided on

- the opposite side of the metering ports for use as drain connections. Drain connections and metering ports are to be interchangeable to allow for measurement flexibility when valves are installed in tight locations.
2. Valves are to be of the "Y" pattern, modified, equal percentage globe style and provide three functions: precise flow measurement; precision flow balancing; positive drip tight shut off.
 3. Valve shall provide multi-turn, 360-degree adjustment with a micrometer type indicator located on valve handwheel. Valve handwheel shall have hidden memory feature which will provide a means for locking the valve position after the system is balanced.
 4. Valve body for valves 1/2" to 2" size shall be bronze with ultra-high strength engineered resin plug. The plug shall have precision-contoured channels to distribute flow uniformly across valve seat. Bronze stem and high strength resin hand-wheel and sleeve. Valves shall have a minimum of four full 360-degree hand-wheel turns. Connections to be thread or sweat.
 5. Valve body for 2-1/2" and larger size valves shall be ductile iron with flanged ends. Valve stem and plug disc shall be bronze. Hand-wheel shall be ergonomically designed providing ease of adjustment. Valve body to be convertible in the field from straight to 90-degree change of flow. Field conversion shall not affect valve accuracy.
 6. Valve shall be installed with flow in the direction of the arrow on the valve body and installed at least five pipe diameters downstream from any fitting, and at least ten pipe diameters downstream from any pump. Two pipe diameters downstream from the valve should be free of any fittings. When installed, easy and unobstructed access to the valve hand-wheel and metering ports for adjustment and measurement are to be provided. Mounting of valve in piping must prevent sediment build-up in metering ports.
 7. Provide all balancing valves with molded removable pre-formed insulation with PVC jacket.
 8. Valve size to match pipe size.

G. Strainers

1. Provide a "Y" type full size strainer as indicated on the Drawings.
2. An approved dirt blowout connection shall be made to each strainer, with 1" Jenkins Figure 372 and Figure 658 cap and chain; the valve located six inches to twelve inches below the strainer. In the case of strainers under full water pressure, the blowout connection shall terminate at a point where there will be no risk of flooding or damage.
3. Strainers 2" diameter and smaller shall have screwed ends. Strainers 2-1/2" diameter and larger shall have flanged ends.
4. Strainers 2" and smaller shall be full size, bronze, "Y" pattern: Tate Temco Figure IY, Spirax Sarco, Mueller or approved equal.

5. Strainers 2-1/2" or larger shall be cast steel body, "Y" type; Tate Temco figure IY, Spirex Sarco, Mueller or approved equal, 150 psi rating.
6. Total open area of basket perforations shall be at least three times the inside area of pipes.
7. Strainer baskets shall be stainless steel with 1/16" perforations (up to 2" size) and 1/8" perforations (2-1/2" and larger).

H. Thermometers and Pressure Gauges

1. Thermometers and pressure gauges shall be Terrice, Ashcroft, Taylor or approved equal complete with all required wells. Model numbers used are Terrice numbers.
2. Thermometers shall be Model BX9, industrial thermometers, adjustable angle, 9" case.
3. Thermometer ranges shall be 0 °F to 200 °F for use in hot water piping.
4. Pressure gauges shall be Model 500 X.

I. Specialties

1. Air vent valves on all main piping systems shall be 1/4" manual gate valves Powell Fig. 507, Lunkenheimer, Crane, or approved equal.
2. Vent valves on coils shall be Bell & Gossett No. 4V, Taco, Armstrong or approved equal.
3. Relief valve shall be Bell & Gossett No. 790-50, Taco, Armstrong, or approved equal, set at 50 psi, 3/4" inlet, 3/4" outlet.

2.10 INSULATION

A. Furnish all insulation required for the air-conditioning system, including:

1. Pipe insulation for:
 - a. Hot water supply (HWS) and hot water return (HWR) piping, including fittings, valves, strainers, etc.
 - b. Condensate Drain piping, including fittings, etc.
2. Duct insulation for:
 - a. All supply, return and fresh air ductwork
 - b. Exhaust ductwork in unheated spaces

B. In general, exhaust air ducts and hot water piping within fin tube enclosure/pipe chase (ventilated) shall not be insulated.

C. Insulation shall be Owens-Corning, Knauf, Certainteed, or approved equal.

- D. Insulate all hydronic piping less than 1-1/2" in diameter with minimum 1-1/2" thick fiberglass pipe insulation with jacket. Insulate all hydronic piping greater than or equal to 1-1/2" in diameter with 2" thick fiberglass pipe insulation with jacket. Jacket shall be multi-layered, weather and mold resistant laminate coated with an acrylic adhesive and providing zero permeability vapor barrier.
- E. Insulate all condensate piping with minimum 3/4" thick closed cell elastomeric foam pipe insulation. Provide with Line-Hide or similar concealment when installed exposed within the building. Insulation shall be as manufactured by Armacell, Aeroflex, K-flex or approved equal.
- F. PVC jackets shall meet ASTM D1784, Class 14253-C have a flame spread of 25 or less, have a smoke developed rating of 50 or less. PVC jackets shall be joined and sealed by applying continuous PVC cement along all seams.
- G. NOTE: All new piping within the mechanical room shall be provided with color coded PVC jackets, color as selected by Engineer/Architect.
- H. Exterior pipe insulation shall be weatherproofed with Childers, Monville, Ferro Corp., or approved equal, aluminum jacketing. The jacketing shall be manufactured from T/3003 aluminum and shall have a factory attached moisture barrier continuously laminated across the full width of the jacketing. Jacket thickness shall be 0.016 inch.
- I. Insulate all supply, return and outdoor air ductwork (within building) with 2" thick, 3/4 lb. density fiberglass duct insulation, ASTM C533, maximum service temperature 450°F, with factory applied flame retardant FSK or PSK facing (UL labeled). Insulation shall have minimum R-value of 6.
- J. Exterior Ductwork: Ductwork to be installed outdoors shall be insulated with 3" thick, 1.5 lb. Density polyolefin foam insulation. Joints to be sealed per manufacture's recommendation. Insulation shall then be wrapped with rubberized asphalt/10 mil polyethylene film membrane. Insulation shall have minimum R-value of 12.
- K. Fiberglass Insulation:
 - 1. Fiberglass shall meet ASTM C 335 for thermal efficiency.
 - 2. Insulation shall be as manufactured by Knauf, Johns-Manville, Owens-Corning or approved equal.
- L. Elastomeric Foam Insulation:
 - 1. Fiberglass shall meet ASTM C 518/C 177 for thermal efficiency.
 - 2. Insulation shall be as manufactured by Armacell, Aeroflex, K-flex or approved equal.

- M. Ends of insulation shall be sealed with material as recommended by the manufacturer.
- N. A complete moisture and vapor seal shall be provided wherever insulation terminates against metal hangers, anchors and other projections through insulation on cold surfaces.
- O. Fire Hazard Rating: Insulation materials, coatings and other accessories shall individually have a fire hazard rating not to exceed 25 for flame spread and 50 for fuel contributed and smoke developed. Ratings shall be determined by U.L. "Test Method for Fire Hazard Classification of Building Materials", No. 823 or NFPA No. 225 or ASTM E84.
- P. Identification: Furnish and apply piping identification to all piping, showing direction of flow approximately 30'- 0" O.C. on bottom, side or top of all pipes. Furnish and apply name or classification of service adjacent to each arrow. Piping identification shall be plastic cloth pipe markers.

2.11 HANGERS, SUPPORTS, ANCHORS, GUIDES, SLEEVES AND MISCELLANEOUS STEEL

A. Pipe Hangers, Supports and Inserts:

- 1. Carpenter and Patterson, Grinnell, Calco, or approved equal. Figure numbers listed are Carpenter and Patterson numbers.
- 2. General: Piping systems shall be supported in accordance with ANSI B31.1 so as to maintain required pitch of lines, prevent vibration, and provide for expansion and contraction movement.
- 3. Piping hangers and supports shall be furnished and installed for piping. Provide all components (i.e., inserts, rods, clamps, hangers, washer, lock nuts, rollers, etc.) necessary for a complete installation.
- 4. Hangers:
 - a. Hangers for hot water supply (HWS), hot water return (HWR), chilled water supply (CHWS) and chilled water return (CHWR) piping shall be Figure 100SH refrigeration hanger and shield.
 - b. Hangers for all other piping shall be Figure 1A Bands.
 - c. All hangers shall be with supporting rods and nuts. Rod sizes shall be as follows:

Hangers for pipes 4" and larger	5/8"
Hangers for pipes 2-1/2" and 3"	1/2"
Hangers for pipes 2" and smaller	3/8"

5. Pipe covering protection saddles shall be Series 350 galvanized steel and shall be furnished for installation at each hanger where pipes are insulated.
 - a. Upper Attachments to Building Structure:
 - b. Reinforced Concrete Construction: Upper attachment welded or clamped to steel clip angles which are expansion-bolted to the concrete. Expansion bolting shall be located so that piping loads place bolts in shear.
 - c. Structural Framing: Upper attachments welded or clamped to structural steel members. Additional steel members may be necessary in some support locations where piping locations differ from that known on contract drawings.
 - d. Submit details for approval.
 6. Expansion Fasteners and Power Set Fasteners: In concrete ceiling construction, expansion fasteners may be used for hanger loads up to one-third the manufacturer's rated strength of the expansion fastener. Power set fasteners may be used for loads up to one-fourth of rated load. When greater hanger loads are encountered, additional fasteners may be used and interconnected with steel members combining to support the hanger.
- B. Pipe guides and Anchors:
1. Furnish and install where shown on the drawings, a system of main anchors and pipe guides to control the expansion of the new water distribution piping. Temperature fluctuation shall be between 40°F and 240°F.
 2. Pipe guides shall be 4-finger spider-and-sleeve type to ensure multiple guiding and to allow for complete insulation of piping. Spider and sleeve shall be formed of two halves to facilitate installation of spider on pipe and mounting of guide to structure. Guides shall be provided in accordance with "Standards of the Expansion Joint Manufacturer's Association", latest edition. Guides shall provide up to 6" of axial pipe movement. Assembly to be fabricated of carbon steel and finished with one coat of rust inhibitive paint.
- C. Pipe Sleeves:
1. Furnish pipe sleeves for all pipes which pass through masonry floors and walls. Sleeves shall be Schedule 10 steel pipe. Sleeves shall be of the first possible size larger than the outside of the insulation jacket on covered piping and the first possible size larger than the outside of the piping on uncovered pipes.

2. Sleeves shall be of sufficient length so as to be flush on either side of masonry walls, flush on underside of masonry floor and extend 2" above the finished floor.

D. Escutcheon Plates:

1. Provide one piece or hinged type wall and ceiling expansion-type plates with round head setscrews or integral pipe clips. Provide recessed type for floors. For copper lines and in finished rooms provide minimum 18-gage spun brass, chrome plated over nickel plates. For all other areas, provide 18-gage enameled cast-iron or steel plates.

2.12 EXHAUST FANS

A. Inline Exhaust Fan

1. Performance ratings: Conform to ANSI/AMCA Standards 210 and 300. Fans must be tested in accordance with AMCA Publications 211 and 311 in an AMCA accredited laboratory and certified for air and sound performance. Fans shall be licensed to bear the AMCA ratings seal for air performance (AMCA 210) and sound performance (AMCA 300).
2. Each fan shall be given an electronic vibration analysis in accordance with ANSI/AMCA Standard 204, while operating at the specified fan RPM. The vibration signatures shall be taken on each bearing in the horizontal, vertical and axial direction. The maximum allowable fan vibration shall be 0.15 in. /sec peak velocity, filter-in reading as measured at the fan RPM. This report shall be provided at no charge to the customer upon request.
3. Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.
 - a. The warranty of this equipment is to be free from defects in material and workmanship for a period of 12 months from the purchase date. Any units or parts which prove defective during the warranty period will be replaced at the manufacturers' option when returned to the manufacturer, transportation prepaid.
 - b. Motor Warranty is warranted by the motor manufacturer for a period of one year. Should motors furnished prove defective during this period, they should be returned to the nearest authorized motor service station.
4. Fan shall be as manufactured by Greenheck, Loren Cook, Twin City Fan or approved equal. Fan shall meet the performance specifications and scheduled capacities.

a. General Description:

- 1) Base fan performance at standard conditions (density 0.075 Lb. /ft³).
- 2) Fans selected shall be capable of accommodating static pressure and flow variations of +/-15% of scheduled values.
- 3) Each fan shall be belt drive in AMCA arrangement 9.
- 4) Fans are to be equipped with lifting lugs.
- 5) After fabrication all carbon steel components shall be cleaned and chemically treated by a phosphatizing process to insure proper removal of grease, oil, scale, etc. Fan shall then be coated with a minimum of 2-4 mils of Permator (Polyester Urethane), electrostatically applied and baked. Finish color shall be RAL 7023, concrete grey. Coating must exceed 1,000-hour salt spray under ASTM B117 test method.

b. Fan Housing and Outlet

- 1) Fan housing to be aerodynamically designed with high-efficiency inlet, engineered to reduce incoming air turbulence.
- 2) Tubular fan housing shall be completely welded and coated with a minimum of 2-4 mils of Polyester Urethane, electrostatically applied and baked. Finish color shall be RAL 7023, concrete grey. No uncoated metal fan parts will be allowed.
- 3) Housing and bearing support shall be constructed of welded structural steel members to prevent vibration and rigidly support the shaft and bearings.
- 4) All mixed flow housings shall include welded steel vanes to straighten airflow prior to exiting the fan discharge.
- 5) Units up to size 27 shall incorporate a universal mounting system that allows the fan to be mounted in either vertical or horizontal configurations and field rotation of the motor position in 90 degree increments. Bearing life shall not be reduced below specified level in different configurations. Units size 30 and larger shall allow for field rotation of motor positions. Units shall accommodate base mount or ceiling hung mounting without structural modifications to the fan.
- 6) An access door shall be supplied for impeller inspection and service.

- 7) OSHA compliant belt guard or motor cover to be included to completely cover the motor pulley and belt(s).

c. Fan Impeller

- 1) Fan impeller shall be mixed flow design. The impeller shall be electronically balanced both statically and dynamically to balance grade G6.3 per ANSI S2.19.
- 2) Fan impeller shall be manufactured with continuously welded steel airfoils and coated with a minimum of 2-4 mils of Polyester Urethane, electrostatically applied and baked. Finish color shall be RAL 7023, concrete grey
- 3) The wheel and fan inlet shall be carefully matched and shall have precise running tolerances for maximum performance and operating efficiency.

d. Fan Motors and Drive

- 1) Motors shall meet or exceed EPACT (Energy Policy ACT) efficiencies. Motors to be NEMA T-frame, 1800 or 3600 RPM, Open Drip Proof (ODP) with a 1.15 service factor.
- 2) Drive belts and sheaves shall be sized for 150% of the fan operating brake horsepower, and shall be readily and easily accessible for service, if required.
- 3) Fan shaft to be turned and polished steel that is sized so the first critical speed is at least 25% over the maximum operating speed for each pressure class.
- 4) Fan shaft bearings shall be Air Handling Quality, bearings shall be heavy-duty grease lubricated, self-aligning or roller pillow block type.
- 5) Air Handling Quality bearings to be designed with low swivel torque to allow the outer race of the bearing to pivot or swivel within the cast pillow block. Bearings shall be 100% tested for noise and vibration by the manufacturer. Bearings shall be 100% tested to ensure the inner race diameter is within tolerance to prevent vibration.
- 6) Bearings shall be selected for a basic rating fatigue life (L-10) of 80,000 hours at maximum operating speed for each pressure class Average Life or (L-50) of 400,000.
- 7) Bearings shall be fixed to the fan shaft using concentric mounting locking collars, which reduce vibration, increase service life, and improve serviceability. Bearings that use set screws shall not be allowed.
- 8) Bearings shall have extended lube lines with Zerk fittings to allow for lubrication.

2.13 AUTOMATIC TEMPERATURE CONTROLS

A. General:

1. Manufacturer's names and model numbers that appear within this specification are for descriptive purposes and are intended to show a level of performance as well as quality of materials. Substitutions may be submitted to the Engineer for approval. Other acceptable manufacturers include; **Siemens, Invensys-ENE and Honeywell.**

B. Scope:

1. The control system provided to consist of all transformers, transducers, relays, thermostats, dampers, damper operators, valves, valve operators and all other necessary control components, along with a complete system, interlocking and communication wiring/cabling to fill the intent of the specification and provide for a complete and operable system.
2. Alarms: Where applicable, and all interlocking wiring required to be provided by the ATC contractor.

C. Incidental Work By Others:

1. The following incidental work to be furnished by the designated contractor under the supervision of the ATC contractor:
 - a. The HVAC contractor to coordinate required work with ATC and, without limiting the generality thereof, the work he is to perform for ATC to include the following:
 - 1) Install automatic valves, sensor wells and other similar equipment that are specified to be supplied by the ATC contractor.
 - 2) Furnish and install all necessary valved pressure taps, water, drain and overflow connections and piping.
 - 3) Provide, on magnetic starters furnished, all necessary auxiliary contacts, with buttons and switches in required configurations.
 - 4) Provide access doors or other approved means of access through ceiling and walls for service to control equipment.
 - b. The Electrical Subcontractor to:
 - 1) Provide all power wiring (110 VAC or greater) to motors. Provide "spare" breakers in electric panels to be used as a power source by ATC contractor for ATC panels.

- 2) Provide power sources for use of the ATC contractor where shown on the electrical plans for ATC compliance with Paragraph E below. In general, this will be used for powering terminal controllers and actuators.

D. Electric Wiring:

1. All electric wiring, wiring connections and all interlocking required for the installation of the temperature control system, as herein specified, to be provided by the ATC contractor, unless specifically shown on the Electrical drawings or called for in the Electrical Specifications, Division 26. Power to valves to be by the ATC contractor, except as specifically noted in the Electrical drawings and specifications.
2. All wiring and wiring methods to comply with the requirements of the Electrical Section of the specifications.
3. Provide, on magnetic starters, all necessary auxiliary contacts, with buttons and switches in required configurations.

E. Guarantee:

1. Upon completion of the installation, the contractor shall provide the necessary maintenance to keep the various control systems in proper working condition, for a period of one (1) year commencing at final project acceptance.
2. The programmed maintenance agreement shall fully describe the maintenance work to be performed and shall advise as to the cost of this work prior to awarding of Contract.

F. Instruction and Adjustment:

1. Upon completion of the project, the ATC contractor to:
 - a. Completely adjust and make ready for use, all transmitters, relays, damper operators, valves, etc., provided under this Section. This contractor shall furnish copies of complete, detailed, calibrating checkout and commissionary documentation for each controller.
 - b. Documentation to list each procedure and shall be signed by the control specialist performing the service.
 - c. The ATC contractor shall provide an on-site training program for the Owner's staff in the operation and use of the control system. Training to include three (3) segments, as follows:
 - 1) Include 8 hours (e.g. one (1) - our (4) hour day) of classroom and hands-on training. This segment to instruct Owner's personnel in the system configuration, component characteristics, control strategy on each controlled system

and all requirements for daily operation and use of the system. This segment to give the Owner's representative a working proficiency in day-to-day operational requirements (i.e., system monitoring, alarm acknowledgment, HVAC system troubleshooting techniques, setpoint and time schedule adjustments, manual override, etc.).

- 2) All training to take place at the site and at times mutually agreed to between the ATC contractor and the Owner. The ATC contractor to provide to the Owner's designated representative, at least three (3) weeks before each segment, a course syllabus outline and schedule. The ATC contractor to provide all training material, reference material and training aids, as required, all as part of his Contract cost.

G. Equipment:

1. General:

- a. The system to be comprised of stand-alone digital controllers, application specific controllers.

2. Application Specific Controllers (ASC)

- a. Each SDC shall be able to extend its performance and capacity through the use of remote application specific controllers (ASCs) through LAN Device Networks.
- b. Each ASC shall operate as a standalone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor based, multi-tasking, real time digital control processor. Provide the following types of ASCs as a minimum:
 - 1) Central System Controllers
 - 2) Terminal Equipment Controllers
 - 3) Each ASC shall be capable of control of the terminal device independent of the manufacturer of the terminal device.

3. Automatic Control Valves:

- a. Control valves shall be two-way pattern as shown, constructed for tight shut off and shall operate satisfactorily against system pressures and differentials. Two-way control valves shall exhibit equal percentage characteristics. Valves with size up to and including 2" shall be screwed with 250 psi ANSI pressure body rating; 2 1/2" and larger valves shall be flanged configuration.

Proportional control valves shall be sized for a maximum pressure drop of 4.0 psig at rated flow (except as noted). Two-position control valves shall be line size and shall be provided with a 250-psi static pressure body rating.

- b. All valves shall be capable of operating in sequence when required by the sequence of operation. All control valves shall be sized by the control manufacturer and shall be guaranteed to meet heating and cooling loads specified.
- c. All control valves shall be suitable for the pressure conditions and shall close against the differential pressure involved. Valve operator connection type (screwed or flanged) shall conform to pipe schedule in this specification.
- d. HOT WATER CONTROL VALVES SHALL BE TYPICAL OF HONEYWELL MODEL #V8043A1029, Johnson Controls, or Belimo. Hot water control valves shall be normally CLOSED, single seated type with equal percentage flow characteristics. The valve discs shall be composition type with bronze trim.
- e. Valves shall be sized on the exact pressure drop for the equipment served to prevent over or under sizing the valves. Provide a separate submittal with all of this information included.

4. Temperature Sensors:

- a. Temperature sensors shall be RTDs or thermistors. Sensor Time Constant shall not exceed 5 seconds for a 60% response to a step change in temperature. Sensor repeatability shall be 0.1°F or better.
- b. Space temperature sensors shall be Typical of HONEYWELL MODEL # T-87F2873, Siemens, or Johnson. Sensors shall be housed in manufacturer standard miniature type thermostat cover and shall include exposed thermometer, setpoint adjustment as specifically called for in the sequence of operation.
- c. Outside air temperature sensor elements for each of the controllers shall be accurate within +0.5°F over a range from -20 °F to 120 °F.

5. Miscellaneous Control Panels:

- a. Details of each panel shall be submitted for review prior to fabrication. Locations of each panel shall be convenient for adjustment and service. Provide engraved nameplate beneath each panel mounted control device clearly describing the function of said device and range of operation. All manual switches shall be flush mounted on the hinged door.
- b. All electrical devices within the panels shall be factory pre-wired to a numbered terminal strip. All wiring within the panel shall be

in accordance with NEMA and UL Standards and shall meet all Local Codes. All wiring in occupied spaces shall be concealed whenever possible. Any exposed wiring shall be enclosed in painted wiremold, color as selected by the BHA.

H. Sequences of Operation:

1. Provide control components for each system as required for the sequence of operation indicated on the contract drawings.

PART 3 - EXECUTION

3.01 GENERAL

- A. Install all items specified under PART 2 - PRODUCTS, according to the applicable manufacturer's recommendations and shop drawings, the details shown on the drawings and as specified under this section. Provide all required hangers and supports. Install all equipment in strict conformance with manufacturers written instructions including maintaining listed operational and maintenance clearance requirements.
- B. HVAC Contractor shall provide, set up and maintain all required hoisting, machinery and staging for the work of this Section. HVAC Contractor shall be responsible for all rigging required for demolition of existing equipment/materials to be removed and for all new equipment/materials to be installed for this Section.

3.02 DEMOLITION

- A. The existing facility will not continue to operate during all phases of the demolition work and subsequent construction.
- B. Provide temporary shoring or bracing during the demolition work to prevent movement, settlement, or collapse of the system or adjacent systems due to the work.
- C. Promptly repair any damage caused to adjacent facilities or areas that are designated to remain at no additional cost to the Owner.
- D. Equipment:
 1. Coordinate with all Contractors and Subcontractors to provide disconnection prior to equipment removal.
 2. Remove equipment by unfastening at the supports or attachments. Then remove the attachments from the building, leaving no component of the original installation.

3. Exercise care with air handling unit motors and other equipment that is to be relocated or turned over to the Owner (equipment to be turned over to owner shall be determined by the owner). Examine the equipment before removal in the presence of the Owner's Representative to determine its condition. Make a record of any marks, by a photograph or videotape acknowledged by the Owner's Representative. Deliver to a location designated by the Owner, and obtain acknowledgement of receipt in good condition.
 4. All equipment, removed but not turned over to the Owner, shall become the property of the General Contractor and shall be removed from the site.
- E. All equipment shall be dropped to the floor by the HVAC Sub-Contractor and become the property of the General Contractor. The General Contractor shall remove equipment, materials, etc. from the building, place in dumpsters and shall be removed from the site by the Contractor.
- F. Remove existing equipment and appurtenances as indicated on demolition plans and as required to install the new systems.

3.03 EQUIPMENT

- A. Equipment shall be installed complete with all required hangers and supports in accordance with the manufacturer's recommendations. Install all equipment in strict conformance with manufacturer's written instructions with recommended clearances for operation and maintenance.
- B. Furnish and install all steel structural support members for proper hanging and support of equipment. Provide vibration isolation on all hangers.

3.04 SHEET METAL WORK

- A. All of the sheet metal work shall be done by contractors regularly engaged in this type of work.
- B. Neatly erect all sheet metal work as shown on plans or as may be required to carry out the intent of these plans and specifications.
- C. All necessary allowances and provisions must be made by this subcontractor in the case of beams, posts, pipes, iron work or other obstructions in the construction of the building or the work of other trades whether or not the same is shown on plans.
- D. All ducts are to be rigid and are to be strongly and carefully supported with suitable braces or angles to keep them true to shape and to prevent buckling.
- E. All joints are to be made tight and all interior surfaces are to be made smooth.

- F. Protect all work under this section from injury during the progress of erection and until final acceptance by the Architect.
- G. All metal work in dead or furred down spaces is to be erected in time to occasion no delay in the work of other trades on the building.
- H. Supply collars to diffusers shall be installed inside the neck of the diffusers. Dampers on all registers and diffusers shall be installed in the open position.
- I. Joints in all ductwork throughout shall be sealed, Class-B. All ductwork shall be taped and sealed.
- J. During the progress of the work and after the completion of the same, this Subcontractor shall remove and place in the General Contractor's dumpster(s) all dirt, debris, rubbish, waste materials, cause by him in the performance of this work, together with all his tools and appliances.

3.05 PIPING AND FITTINGS

- A. Provide and erect in a workmanlike manner according to the best practices of the trade, all piping shown on the plans or required to complete the installation intended by these specifications.
- B. This contractor shall inform himself from the Architect's specifications and detailed drawings of the exact dimensions of finished work in all rooms where equipment or pipes are to be placed, and arrange his work accordingly, assuming all responsibility for conformity with the surrounding work.
- C. In the erection of mains, special care must be used in their support and proper allowance shall be made for expansion.
- D. All steel piping larger than 2" shall have welded joints made by experienced pipe welders. The joints shall all be well filled with metal without interior projections. After welds are made, this contractor shall thoroughly clean inside and leave a smooth bore. Where connections are made on runs, weld-o-lets or thread-o-lets are to be used.
- E. All other connections are to be made with screwed fittings.
- F. In making welds, this contractor is to have the end of the pipe properly beveled and perfectly lined up.
- G. Keep plugged or capped all openings in pipes or fittings.
- H. Connections to mains are to be provided with swing arms to provide for expansion.

- I. Make such offsets as are shown or required to place pipes on risers in proper position or to avoid other work. Make such offsets neatly and properly locate them to the satisfaction of the Architect.
- J. All pipe lines are to be provided with sufficient number of flange fittings or unions to make possible the taking down of the pipes without breakage of fittings. Lines 2" in diameter and less may be connected by R & L couplings, unless otherwise required by the Architect. All of the piping shall be erected so as to provide for the easy flow of water and noiseless circulation. Whenever pipes are cut, three-wheel cutters are to be used and the pipes are to be carefully reamed out.
- K. Due to the extreme limited headroom, all water mains shall be installed perfectly level or with minimum pitch. Install air vents on all high points and drawoff valves on all low points throughout the entire system.
- L. The entire piping system shall be provided with shutoff valves and drawoff valves so that sections of the system may be drained without interrupting the entire system.
- M. Extreme care shall be exercised in the location of all piping.
- N. No crosses or bull head tees shall be used in any part of the work.
- O. Piping connections to all equipment shall be made with companion flanges or unions for ease in removal of equipment.
- P. Provide approved pipe identification markers and flow direction arrows on all piping. Markers to be at 30' intervals, except in boiler room where they shall be at 10' intervals.

3.06 VALVES AND ACCESSORIES

- A. Valves:
 - 1. Valves shall be installed where shown on plans and elsewhere as necessary for the proper operation or balancing of the systems.
 - 2. At completion, this contractor shall install stamped brass tag on each valve held on with brass drain (except on fan-coil unit valves) with numbers. This contractor is to make up schedule with number of each valve. Schedule to describe use of each valve. One copy of schedule to be framed under glass and hung in boiler room. Two more copies are to be supplied to the Architect.
 - 3. Extreme care must be used in locating fin tube radiation valves and fittings in order that they shall be installed so as to be readily accessible.
 - 4. Install on each coil a key type compression air valve.

5. Strainers
6. Strainers shall be installed at all points shown on the plans. All strainers shall be cleaned prior to balancing, and again at completion of installation.

B. Pipe Hangers:

1. Pipe hangers of the types specified shall be installed for the support of all piping. Maximum center-to-center hanger spacing shall be as follows, except as otherwise indicated on the Drawings.

<u>Pipe Size</u>	<u>Max. Spacing</u>
Up to 1-1/4"	5'-0"
1-1/2" and 2"	8'-0"
2-1/2" and 3"	8'-0"
Over 4"	10'-0"

C. Sleeves:

1. Sleeves shall be installed for each pipe passing through masonry floors or walls.

D. Escutcheon Plates:

1. Escutcheon plates shall be installed on all piping passing through finished floors, walls or ceilings. Escutcheon plates shall be sized for outside diameter of insulation and installed after insulation is completed.

E. Specialties:

1. Specialties of the type specified shall be installed at points specified and elsewhere where shown on the drawings.
2. Air vent valves shall be installed at every high point throughout the system.

3.07 INSULATION

- A. All of the insulation work shall be done by contractors regularly engaged in this type of work in a neat and workmanlike manner. All insulation shall be completely sealed with no glass fibers exposed to the air.
- B. The entire water piping system, including piping, valve bodies, fittings, specialties, air separator, pump casings, shot feeder, etc., shall be carefully insulated throughout for thermal control and to prevent condensation. Special care shall be exercised to ensure that all piping, valve bodies and fittings are well insulated with vapor barrier at the fan-coil units, up to the final connection at the coil so as to prevent condensation from forming and dripping on the ceiling. All

insulated equipment which requires servicing shall be insulated with removable sections.

- C. All piping insulation in mechanical room shall be enclosed in a PVC Jacket, color to be as selected by the Engineer.
- D. The entire air distribution system shall be carefully insulated throughout for thermal control and to prevent condensation. All insulated equipment which requires servicing shall be insulated with removable sections.

3.08 DUCT CLEANING - ALL EXISTING TO REMAIN DUCTWORK & AIR OUTLETS

- A. Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.
- B. Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.
- C. Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.
- D. Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.
- E. Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.
- F. Service Openings: The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.
 - 1. Contractor shall utilize the existing service openings already installed in the HVAC system where possible.
 - 2. Other openings shall be created where needed and they must be created so they can be sealed in accordance with industry codes and standards.

3. Closures must not significantly hinder, restrict, or alter the airflow within the system.
 4. Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
 5. Openings must not compromise the structural integrity of the system.
 6. Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.
 7. Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.
 8. Rigid fiber glass duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiber glass duct system closures.
 9. All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the owner in project report documents.
- G. Ceiling sections (tile): The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.
- H. Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.
- I. Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and exhaust fans: The contractor shall insure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. Contractor shall:
1. Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.
 2. Assure that a suitable operative drainage system is in place prior to beginning wash down procedures.
 3. Clean all coils and related components, including evaporator fins.
- J. Duct Systems: Contractor shall:
1. Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas.
- K. Mechanical Cleaning Methodology - The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods. No

cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.

1. All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
2. All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
3. All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.
4. All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those, which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.

L. Methods of Cleaning Fibrous Glass Insulated Components

1. Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet.
2. Cleaning methods used shall not cause damage to fibrous glass components.

3.09 CLEANING AND WATER TREATMENT

A. General:

1. Provide, where shown on the drawings and as specified hereinafter, the necessary apparatus to provide cleaning water treatment and complete water treatment services for the hot water system.
2. A contract agreement satisfactory in form and substance to the Owner shall be executed between the Contractor and the water treatment

company through its authorized agents, binding the water treatment company to provide supervisory service to assure the use of proper chemical treatment to the system for a period of one year from the date of the initial system start and treatment thereof. The contract shall be assigned to the Owner on the date that the building is accepted by the Owner so that water treatment will continue uninterrupted during the one-year life of the contract. The water treatment company shall perform the following consulting analysis service.

3. Supervise the cleaning and flushing out of the system.
 - a. After completing the installation or modification of the system, it shall be properly flushed out prior to start-up. Flush-out chemicals and procedures shall be furnished by the water treatment company.
 - b. Tests shall be made following the flush-out procedure and a written report submitted to the Engineer, Owner and Contractor stating that the flushing-out has been completed satisfactorily. Residual chemical levels shall be limited as follows:
 - 1) phosphate – zero
 - 2) alkalinity to 100 ppm max.
 - 3) suspended solids – zero
 - 4) pH value of 8.4 or less
 - c. All side loops and low points shall be drained and flushed.
 - 1) Systems shall then be refilled and treated chemically in accordance with recommendation of the water treatment company. The Contractor shall notify the water treatment contractor at least 48 hours in advance of initial system fill.
4. Supervise and instruct the Owner's operating personnel in the following:
 - a. initial introduction of water treatment to all systems and the control thereof;
 - b. chemical product literature, identification for use and application procedure;
 - c. testing procedure and interpretation of test results and proper control limits for each constituent; and
 - d. log sheets with instructions in correct entry procedure.
5. Provide service calls at frequency of not less than one call per month thereafter.
6. Furnish all required chemicals for proper treatment of the system for the one-year period together with the necessary control testing kit or apparatus

and reagents for field analysis of the water during the aforementioned one-year period.

7. Provide written reports of water analysis results with recommendations.
8. Provide a quarterly review of conditions with the Owner.
9. The Contractor shall assume responsibility for the field testing and control and the regular addition of chemical treatment.

B. Qualifications of the Water Treatment Company:

1. The water treatment company shall have a minimum of five years' experience in the water treatment business, have laboratory facilities and staff capable of performing all necessary analyses relating to this job, and the treatment programs shall be under the direction of a graduate chemist or licensed professional engineer.

C. Cleaning and Flushing:

1. Exercise every precaution to avoid introducing foreign matter such as welding beads and slag or dirt into the piping system. All completed welds shall be hammered to loosen debris. All piping, valves and fittings shall be internally cleaned of oil, grease or dirt, prior to assembly into system by use of wire brush and swab.
2. All cleaning and flushing work shall be coordinated with and supervised by the water treatment company for chemicals and procedures to be followed.
3. Following the successful testing of the piping systems, they shall be cleaned under the supervision of the water treatment company.
4. Before submitting piping systems for acceptance, all strainers shall be inspected and thoroughly cleaned.
5. Cleaning shall be started only after all piping has been hydrostatically tested and all systems have been completely connected up.
6. Operate pumps and circulate water throughout system for period of three 8-hour days. At the end of each day of circulation, remove and clean all strainer baskets and blow off all low points.

D. Closed Recirculation Systems:

1. The piping system shall be thoroughly flushed and cleaned with Dearborn BC-45 Cleaner, Dow, Barclay or approved equal, and charged with Dearborn B-329 Nitrite Corrosion Inhibitor, Dow, Barclay or approved equal, after cleaning. Control limits of 800 to 1,000 ppm shall be maintained. The bypass shall be piped across the suction/discharge pipes of the system.

3.10 VIBRATION AND ISOLATION

A. Application:

1. Refer to the PRODUCTS section of this specification for vibration isolation devices identified on the drawings or specified herein.
2. The static deflection of all isolators specified herein is the minimum acceptable deflections for the mounts under actual load. Isolators selected solely on the basis of rated deflection are not acceptable and will be disapproved.

B. Major Equipment Isolation:

1. Unless otherwise shown or specified, all floor-mounted major equipment shall be set on housekeeping pads. See architectural or structural drawings for details.
2. Types and minimum static deflections of vibration isolation devices for major equipment items shall be as scheduled on the drawings or specified hereunder.
3. Flexible duct connections shall be installed at all fan unit intakes, fan unit discharges, and wherever else shown on the drawings.
4. Flexible pipe connections shall be installed at all pipe connections to vibration-isolated equipment in the positions shown on the drawings.
5. Electrical connections to vibration-isolated equipment shall be flexible, as called for in the electrical portion of the specification.
6. Thrust restraints shall be installed on all suspended fans and on all floor-mounted fans developing 4" or more of static pressure, unless the horizontal component of the thrust force can be demonstrated to be less than 10% of the equipment weight.

C. Miscellaneous Mechanical Equipment Isolation:

1. Miscellaneous pieces of mechanical equipment, such as converters, pressure reducing stations, dryers, strainers, storage tanks, condensate receiver tanks, and expansion tanks, which are connected to isolated piping systems, shall be vibration-isolated from the building structure by Type NP or Type HN isolators (selected for 0.1" static deflection), unless their position in the piping system requires a higher degree of isolation as called for under Pipe Isolation.

D. Pipe Isolation: All chilled water, condenser water, hot water, steam, refrigerant, drain and engine exhaust piping that is connected to vibration-isolated equipment shall be isolated from the building structure within the following limits:

1. Within mechanical rooms: Within 50' total pipe length of connected vibration-isolated equipment (chillers, pumps, air handling units, pressure reducing stations, etc.); At every support point for piping that is greater than 4" in diameter. Piping shall be isolated from the building structure by

means of vibration isolators, resilient lateral supports, and resilient penetration sleeve/seals.

2. Isolators for the first three support points adjacent to connected equipment shall achieve one half the specified static deflection of the isolators supporting the connected equipment. When the required static deflection of these isolators is greater than 1/2", Type FSN or HSN isolators shall be used. When the required static deflection is less than or equal to 1/2", Type FN or HN isolators shall be used. All other pipe support isolators within the specified limits shall be either Type FN or HN achieving at least 1/4" static deflection.
3. Where lateral support of pipes is required within the specified limits, this shall be accomplished by use of resilient lateral supports. Pipes within the specified limits that penetrate the building construction shall be isolated from the building structure by use of resilient penetration sleeve/seals.
4. Provide flexible pipe connections as called for under Major Equipment above and wherever shown on the drawings.

E. Duct Isolation:

1. All sheet metal ducts and air plenums that are within mechanical rooms or within a distance of 50' total duct length of connected vibration-isolated equipment (whichever is longer) shall be isolated from the building structure by Type FN, PCF or HN isolators. All isolators shall achieve 0.1" minimum static deflection.
2. Ducts within the specified limits that penetrate the building construction shall be isolated from the building structure by use of resilient penetration sleeve/seals.
3. Flexible duct connections shall be provided as called for above under Major Equipment and wherever shown on the drawings.

3.11 MISCELLANEOUS IRON AND STEEL

- A. Provide steel supports and hangers required to support fans, ductwork, and other equipment or materials. Submit details of steel supports and method of fabrication for approval.
- B. All work shall be cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets, and framework shall be properly sized and strongly constructed.
- C. Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be by experienced metal working mechanics. Members shall be straight and true and accurately fitted. Scale, rust, and burrs shall be removed. Welded joints shall be ground smooth where exposed.

Drilling, cutting and fitting shall be done as required to properly install the work and accommodate the work of other trades as directed by them.

- D. Members shall be generally welded, except that bolting may be used for field assembly where welding would be impractical. Welders shall be skilled.
- E. All shop-fabricated iron and steel work shall be cleaned and dried and given a shop coat of paint on all surfaces and in all openings and crevices.
- F. All fasteners connected to structure (aluminum) shall be aluminum or stainless steel.

3.12 AUTOMATIC TEMPERATURE CONTROLS

- A. System shall be complete with all control wiring, switches, relays, transformers, and other accessories.
- B. The Control System herein specified shall be free from defects in workmanship and material under normal use and service. After completion of the installation, regulate and adjust all thermostats, control valves, control motors, and other equipment provided and/or wired under this contract. If within twelve (12) months from the date of completion, any of the system herein described is proved to be defective in workmanship or materials, it will be replaced or repaired free of charge.
- C. Provide any service incidental to the proper performance of the Control System under guarantees outlined above for the period of one year. Normal maintenance of the system or adjustments of components is not to be considered part of the guarantee.
- D. Sequences of Operation: Provide current sequences for all equipment as indicated in the Contract Drawings.

3.13 BALANCING, ADJUSTING, OPERATING, AND INSTRUCTIONS

- A. The HVAC contractor shall engage the services of an independent firm to perform testing, adjusting and balancing of the HVAC systems. The HVAC subcontractor shall submit to the owner at least three qualified firms for the owner's review and acceptance, start up and adjusting.
- B. Engage a balancing company to adjust, balance, and operate the heating and ventilating system and thoroughly instruct the Owner's personnel in all phases of care and operation of the systems. The Balancing Company shall be certified by Associated Air Balance Council or by the National Environmental Balancing Bureau.

- C. Before the air systems are tested and balanced, ducts and equipment shall be thoroughly cleaned by the contractor so that no dirt, dust, or other foreign matter will be deposited in or carried through the systems. For this purpose, cheesecloth shall be placed over each opening for entraining such particles during the cleaning operation.
- D. The Balancing Company will not perform water systems balancing until after the systems have been cleaned and treated by the Contractor.
- E. The Contractor as a part of this contract shall provide all materials, labor, and service of all subcontractors for fulfillment of air and water balancing of all systems. The Balancing Company shall inform Contractor of all requirements ahead of time.
- F. All equipment shall be operated and adjusted and all air systems shall be adjusted and balanced, readings taken and recorded on an approved form submitted to the Engineer for approval, readjusted and rebalanced in accordance with the Engineer's review comments and resubmitted.
- G. Air Systems
 - 1. Systems shall be adjusted and balanced so that air quantities at outlets are as indicated on the drawings and so that the distribution from supply outlets is free from drafts, and uniform over the face of each outlet.
 - 2. Adjustments shall be made by the Balancing Company to volume dampers at air outlets to produce the least pressure drop consistent with volume requirements.
 - 3. After completion of balancing and adjusting, settings of dampers, shall be permanently marked by the Balancing Company so that they can be restored if disturbed at any time.
 - 4. Direct reading velocity meters may be used by the Balancing Company for comparative adjustment of individual outlets, but air quantities in ducts have velocity of 1,000 feet per minute or greater, shall be measured by means of pitot tubes and inclined gauge manometers. Instrument test opening enclosures as specified shall be provided as required.
 - 5. Adjustment of the temperature controls shall be coordinated by the person in charge of the balancing and adjusting and shall be performed coincidental therewith. In conjunction with the Automatic Temperature Control System, simulate a complete cycle of operation for each system.
 - 6. After completion of the testing, balancing and adjusting of the air systems, six copies of a report showing the following information shall be submitted to the Engineer for review and approval. The report shall be arranged as follows:
 - a. Location of each air outlet or inlet.

- b. Dimensions or size of each outlet or inlet.
- c. Type: diffuser, grille, register, supply, return exhaust, and Ak value for each.
- d. Cfm of air as indicated on drawings for each outlet or inlet.
- e. Cfm of air as measured, after each complete system has been balanced and adjusted, for each outlet or inlet.
- f. After each complete system has been balanced and adjusted, the total cfm at fan discharge, static pressure at fan outlet, total static pressure for apparatus, fan speed, motor amperage for each phase and voltage shall be listed.

H. Water System:

1. Water circulating system shall be adjusted and balanced by the Balancing Company so that water quantities circulated through all coils, pumps, equipment, etc., will be as specified.
 2. Where no meters are provided, the adjustment of individual coil circuits shall be based on return water temperature, provided air balancing and adjusting has been satisfactorily completed first. Temperature control valves on each branch shall be wide open during the balancing. Adjustment of water flows through coils shall be based on manufacturer's pressure drop data. Balancing cocks and valves shall be set. The settings of cocks, valves, etc., shall be permanently marked so that they can be restored if disturbed at any time.
 3. The following shall be established and listed:
 - a. Temperatures and water flow at the pumps and each coil after each complete system has been balanced and adjusted.
 - b. Pressure drops, manufacturer's ratings, and water flow at each coil after each complete system has been balanced and adjusted.
 - c. Suction and discharge pressures at each pump and total water flow at each coil after each complete system has been balanced and adjusted.
 - d. Motor amperage for each phase and voltage at each pump.
- I. The Balancing Company shall provide all instruments and accessories required to perform the tests.
- J. Prior to the demolition of the existing hydronic heating system, testing shall be performed to determine water flows and pressure drops in all branches and risers indicated to remain as well as in any branches/risers that are found to serve equipment on the upper floors of the building. This information is to be transmitted to the Engineer for review and to be utilized in balancing of the newly installed system.

- K. Upon completion of the systems, during the first stages of the first cooling season, the Balancing Company shall operate the systems until temperatures in all areas are uniform. The period of time shall be no less than a five-day, forty-hour period. During these times, the Balancing Company shall keep at least two men on the job continuously, together with a man from the temperature control Sub-Subcontractor for the purpose of testing and balancing systems.
- L. The Contractor shall obtain from the manufacturer of each piece of equipment, five (5) copies of lubrication, operating and maintenance data sheets and control system drawings. He shall prepare five (5) complete sets of written coordinating operating and maintenance instructions into complete operating and maintenance manuals.

3.14 TESTING AND ADJUSTMENTS

- A. After the installation is completed and ready for operation, clean and test the system under normal operating conditions. Whenever the equipment or system under test is interrelated with and depends upon the operation of other equipment, systems and controls for proper operation, functioning and performance, the latter shall be operated simultaneously with the equipment or system being tested.
- B. All defective work shall be promptly repaired or replaced and the tests shall be repeated until the system or component parts thereof receive the approval of the Engineer. Any damage resulting from tests shall be repaired and damaged materials replaced, all to the satisfaction of the Architect.
- C. Tests shall be performed in the presence of and to the satisfaction of the Architect and such other parties as may have legal jurisdiction.
- D. Labor, materials, instruments, and power required for testing shall be furnished by this Contractor unless otherwise indicated under another Section of the Specifications.
- E. Air/smoke test all supply and exhaust air ducts using a test pressure fan. Any leaks observed by this contractor, the engineer and the owner shall be sealed tight and retested to ensure a leak free duct system.

3.15 PLACING IN SERVICE

- A. At the completion of performance tests and following approval of test result, recheck all equipment to see that each item is adequately lubricated and functioning correctly.

3.16 COMPLETION

- A. Provide properly executed certificate of inspection from authorities having jurisdiction.
- B. Instruct such persons as the Owner designates in the proper operation and maintenance of the systems and their parts. Submit to the Architect a letter naming the person or persons so instructed and the dates of such instruction.
- C. Prepare and deliver literature showing operation, service and replacement data for all equipment which will require periodic maintenance or replacement.
- D. Verify that project record documents are complete as specified under Submittals and Record Documents.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 00 00

ELECTRICAL

**Filed Sub-Bid Required
Electrical**

PART 1 - GENERAL

1.01 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and Contract Conditions as listed in the Table of Contents, and applicable parts of Division 01 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

1.02 FILED SUB-BIDS

- A. ELECTRICAL is stipulated as a Filed Sub-Bid under Part B, Item 2, of the FORM FOR GENERAL BID.
- B. All sub-bids shall be submitted on the FORM FOR SUB-BID furnished by the Awarding Authority as required by Section 44G of Chapter 149 of the General Laws, as amended.
- C. Sub-bids must be filed with the Awarding Authority in a sealed envelope, before the time stipulated in the ADVERTISEMENT, on the date stipulated in the ADVERTISEMENT.
- D. Specific information relating to sub-bidders is set forth in the CONTRACT DOCUMENTS under the heading, "NOTICE TO ALL BIDDERS", and the attention of the sub-bidders is directed thereto.
- E. The work to be done under this Section 26 00 00 is described herein, and on Drawings E0.1, E0.2, E1.0, E1.1, E1.2, E2.0, E2.1, E2.2 and also AV0-01, AV1-01, AV2-01.

1.03 GENERAL REQUIREMENTS

- A. The GENERAL REQUIREMENTS, DIVISION 01, and PROCUREMENT AND CONTRACTING REQUIREMENTS, DIVISION 00, are hereby made a part of this Specification Section.
- B. Examine all Drawings and all Sections of the Specifications for requirements therein affecting the work and this Section.
- C. Include the General Conditions, Modifications to the General Conditions, and applicable parts of Division 01 00 00 as part of this Section.

- D. 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.
- E. 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.
- F. 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.

1.04 SCOPE OF WORK

- A. Conditions of the Contract and Division 01, General Requirements, apply to work of this Section. Where Paragraphs of this Section conflict with similar paragraphs of Division 01, requirements of this Section shall prevail.
- B. Examine Drawings and other Sections of Specifications for requirements that affect work of this Section.
- C. As used in this Section, “provide” means “furnish and install” and “HVAC” means “Heating, Ventilating and Air Conditioning” and “POS” means “Provided Under Other Sections”. “Furnish” means “to purchase and deliver to the project site complete with every necessary appurtenance and support,” and “Install” means “to unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.” “EC” refers to this Electrical Contractor. “GC” refers to General Contractor.
- D. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation. Remove all debris caused by contractors’ work.
- E. Drawings are diagrammatic and indicate general arrangement of systems and work included in Contract. It is not intended to specify or to show every offset, fitting or

component; however, Contract Documents require components and materials whether or not indicated or specified as necessary to make the installation complete and operational.

- F. Perform work strictly as required by rules, regulations, standards, codes, ordinances, and laws of local, state, and federal government, and other authorities that have lawful jurisdiction.
- G. Give notices, file plans, obtain permits and licenses, pay fees and obtain necessary approvals from authorities that have jurisdiction. All backcharges from the Utility shall be paid for by the Owner.
- H. As work progresses and for duration of Contract, maintain complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately, including work installed as a modification or addition to the original design.
 - 1. Work shall include, but shall not be limited to, the following:
 - 2. Raceways and conduit
 - 3. Outlet Boxes
 - 4. Cable Supports and Boxes
 - 5. Junction boxes, Pull boxes and Cable Troughs
 - 6. Wire and cable
 - 7. Branch circuit wiring
 - 8. Wiring devices and plates
 - 9. Circuit breakers.
 - 10. Lighting fixtures including lamps
 - 11. Fluorescent ballast and LED drivers
 - 12. Sleeving.
 - 13. Fire seal, (and) fire-proof foam, Fire Stopping
 - 14. Supervision and approval.
 - 15. Fire Alarm Devices
 - 16. Electrical connections to HVAC equipment and other equipment provided under other Sections or by Owner.
 - 17. Nameplates, labels and tags.
 - 18. Testing.
 - 19. Operating and maintenance instructions and manuals.
 - 20. Shop drawings.
 - 21. Audio/Visual System per drawings AV0-01, AV1-01, AV2-01.

1.05 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Contractor's

failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

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

1.06 CONTRACT DOCUMENTS

- A. Work to be performed under this Section is shown on the Electrical Drawings.
- B. Electrical Contractor shall refer to general Architectural, Electrical and other Drawings and other Sections that indicate types of construction in which work shall be installed and work of other trades with which work of this Section must be coordinated.
- C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any item, in the drawings or specifications or both, carries with it the instruction to furnish and install the item, regardless of whether or not this instruction is explicitly stated as part of the indication or description.
- D. Items referred to in singular number in Contract Documents shall be provided in quantities necessary to complete work.
- E. Drawings are diagrammatic. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, the contractor shall provide all other components and materials necessary to make the systems fully complete and operational.
- F. Information and components shown on riser diagrams, but not shown on plans, and vice versa, shall apply or be provided as if expressly required on both.

1.07 DISCREPANCIES IN DOCUMENTS

- A. Address questions regarding drawings to Architect in writing before award of contract; otherwise, Architect's interpretation of meaning and intent of drawings shall be final.

1.08 SITE VISIT

- A. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

1.09 CODES, STANDARDS, AUTHORITIES AND PERMITS

- A. Perform work in strict accordance with the rules, regulations, standards, codes, ordinances, and laws of local, state and federal governments and other authorities having legal jurisdiction over the site.
- B. Underwriters' Laboratories (UL) shall list material and equipment.
- C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from authorities that have jurisdiction.

1.10 GUARANTEE AND 24-HOUR SERVICE

- A. Guarantee all work in writing for one year from date of final acceptance. Repair or replace defective materials or installation at no cost to Owner within 24 hours of notice. Correct damage caused in making necessary repairs and replacements under guarantee at no cost to Owner.
- B. Submit guarantee to Architect before final payment.
- C. Statement of guarantee requirements shall not be interpreted to limit Owner's rights under law and this contract.

1.11 RECORD DRAWINGS

- A. Maintain record drawings on site. Record set must be complete and current and available for inspection when requisitions for payment are submitted.

1.12 SUBMITTALS

- A. Refer to Section 01 33 00 for submittal procedures.
- B. Material and equipment requiring Shop Drawing and Product Data submittal shall include but shall not be limited to:
 - 1. Circuit breakers.
 - 2. Conduit and raceways.
 - 3. Wire and cable.
 - 4. Branch circuit wiring.
 - 5. Wiring devices and plates.
 - 6. Lighting Fixtures
 - 7. Outlet Boxes

8. Pull boxes and cable troughs.
 9. Fire alarm devices.
- C. Electrical Contractor shall provide a complete set of approved submittals to the owners.
- D. In the event that this Contractor fails to provide Shop Drawings for any of the products specified herein:
1. Contractor shall furnish and install all materials and equipment herein specified in complete accordance with these Specifications.
 2. If the Contractor furnishes and installs material and/or equipment which is not in complete accordance with these Specifications, he shall be responsible for the removal of this material and/or equipment from the Work, and shall be responsible for the replacement of this material and/or equipment with material and/or equipment which is in complete accordance with these Specifications, at the direction of the Owner's Representative.
 3. Removal and replacement of materials and/or equipment which are not in complete compliance with these Specifications shall be executed by the Contractor at no extra cost to the Owner.
 4. Removal and replacement of materials and/or equipment which are not in complete compliance with these Specifications shall not be allowed as a basis for a claim of delay of completion of the Work.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Submit operation and maintenance data complete with at least the following:
1. Table of Contents
 2. Introduction:
 - a. Explanation of manual and its use
 - b. Description of all systems
 3. Plant Operation
 - a. Operating instructions for all Electrical apparatus, as listed below.
 4. Maintenance
 - a. Maintenance and lubricating chart for generator: Furnish three sets of charts indicating equipment tag number, location of equipment, equipment service, greasing and lubricating requirements, lubricants and intervals of lubrication.
 - b. Recommended list of spare parts: Furnish two typed sets of instructions for ordering spare parts with sectional views of the

equipment showing parts numbered or labeled to facilitate ordering replacements, including a list with itemized prices of those parts recommended to be kept on hand as spares, as well as the name and address of where they may be obtained.

1.14 SEQUENCING

- A. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

1.15 CUTTING AND PATCHING

- A. All cutting and patching one (1) square foot and less in area, or the circular equivalent, necessary for the proper installation of work to be performed under this Section and subsections shall be performed by the Electrical Contractor. All cutting and patching greater than one (1) square foot in area, or the circular equivalent, necessary for the proper installation of work performed under this Section and subsections shall be performed by the General Contractor.

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. Rigid metallic conduit shall be zinc-coated steel that conforms to industry standards, by Allied Tube and Conduit, Republic Steel, Wheatland Tube or approved equal.
- B. Intermediate metal conduit (IMC) shall be zinc-coated steel that conforms to industry standards, by Allied tube and Conduit, Triangle/PWC or approved equal.
- C. Electrical metallic tubing (EMT) shall be zinc-coated steel that conforms to industry standards, by Republic Steel, Allied Tube and Conduit, Triangle/PWC or approved equal.

- D. Wireways shall be sheet steel with hinged spring-latched covers, galvanized or painted to protect against corrosion. Provide necessary bends, couplings, connectors and other appurtenances. Interior parts shall be smooth and free of sharp edges and burrs. Wireways shall be by Square D or approved equal.
- E. Flexible metallic conduit shall be galvanized, spiral wrapped metallic conduit (Greenfield) or liquid-tight flexible metallic conduit as specified for specific equipment.
- F. No aluminum conduit shall be used.
- G. Conduit expansion fittings shall be threaded hot-dipped galvanized malleable iron with internal bonding assembly by O.Z./Gedney or approved equal.
- H. Conduit fire seat fittings shall have heat-activated intumescent material for fire rating equal to or higher than that of floor or wall by O.Z./Gedney or approved equal.
- I. Provide water-tight gland sealing assemblies with pressure bushings as required for penetrations.
- J. Provide threaded malleable iron or steel connectors and couplings with insulated throats; manufactured elbows; locknuts; and plastic or bakelite bushings at terminations, as necessary. Couplings and connectors shall be gland and ring compression or stainless-steel multiple point locking or steel concrete-tight set screw. Compression couplings and connectors shall form positive ground. Set-screw connectors and couplings shall have wall thickness equal to conduit, case-hardened, hex-head screws and separate ground wire. Bushings for rigid steel conduit and connectors for EMT shall have insulating inserts that meet requirements of UL 514 flame test.

2.02 OUTLET BOXES

- A. Outlet boxes on concealed work shall be at least 4" square or octagonal, galvanized pressed steel with plaster rings as required. Outlet boxes for exposed conduit work shall be cast aluminum alloy with cast aluminum alloy covers.
- B. Where installed in plaster, boxes shall be fitted with galvanized steel plaster covers of required depth to finish flush with finished wall or ceiling.
- C. Switch boxes, receptacle boxes and other outlet boxes shall be standard 4" square with plaster rings or gang covers as required.
- D. Outlet boxes shall be by Steel City Electric Company, Appleton Electric Company, National Electric Products Company or approved equal.

- E. Outlet boxes for various systems and components shall be as required by manufacturer.
- F. Waterproof boxes shall be Condulet Cast Boxes with water-proof devices and covers. Provide hot-dipped galvanized corrosion-resistant epoxy enamel finish or PVC-coated products, where noted on Drawings. Boxes shall be by Steel City Electric Company, Appleton Electric Company, National Electric Products Company or approved equal.
- G. Provide screw-joint outlet boxes, with gasketed weatherproof covers in exterior locations, where exposed to moisture, at kitchen and cafeteria equipment with or next to water or steam connections, and where indicated as weatherproof on Drawings.
- H. Provide only enough conduit openings to accommodate conduits at individual location. Each box shall be large enough to accommodate number and sizes of conduits, wires and splices to meet NEC requirements, but shall be at least size shown or specified. Necessary volume shall be obtained by using boxes of proper dimensions. Box depths greater than 2-1/8" shall not be used to obtain necessary volume, but may be used with Owner's Representative's approval to facilitate installation. Standard concrete boxes may be 6" deep where necessary to permit entrance of conduits into sides of boxes without interference with reinforcing bars. Octagonal hung ceiling boxes with suspension bars may be 3-1/2" deep. Rectangular boxes for inter-connection of branch circuit conduits may be 2-1/2" deep.

2.03 JUNCTION BOXES, PULL BOXES AND CABLE TROUGHS

- A. Provide code gauge galvanized steel junction and pull boxes for conduit 1-1/4 inches trade size and larger, where indicated and as necessary to facilitate installation, of required dimensions, with accessible, removable screw-on covers. Provide junction and pull boxes in special sizes and shapes determined in field where necessary.
- B. Junction box covers shall be accessible. Do not install junction boxes above suspended ceilings except where ceiling is removable or where access panel is provided.
- C. Sheet metal pull boxes shall be supported adequately to maintain shape. Larger boxes shall have structural steel bracing welded into rigid assembly formed adequately to maintain alignment in shipment and installation. Secure covers with corrosion-resistant screws or bolts.
 - 1. Pull boxes exposed to rain or in wet locations shall be weatherproof.
 - 2. Provide clamps, grids and other appurtenances to secure cables. No cable shall be unsupported for more than 30 inches.

3. No pull box shall be within 2 feet of another.
 4. Provided sealed, cast-alloy, hazardous-location boxes with sealing fittings in garages and other areas in which flammable gases or vapors may be present to prevent transmission of gases or vapors through conduits.
 5. Pull boxes connected to concealed conduits shall be mounted with covers flush with finished wall or ceiling. No aluminum pull box shall be embedded in concrete.
- D. Provide cable troughs of special shapes, design and construction required to install, support and enclose feeder cable throughout indicated routing. Troughs shall be as specified above for junction and pull boxes, with reinforcing, insulating supports and clamping for cable installation. Cables shall be continuous throughout troughs, and shall be racked in distributed phase groupings arranged with phase cables surrounding neutral conductors.

2.04 WIRE AND CABLE (600 V INSULATION)

- A. Provide single-conductor, annealed copper wire and cable with insulation rated 600 V, of sizes specified and scheduled on Drawings, by General Electric, Rome, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire insulated for 300 V may be used where voltage is less than 100 V, if isolated from higher voltages. Wire sizes shown and specified are American Wire Gauge for copper.
- B. Armored cable shall be Type MC 600 V copper with full-sized insulated ground conductor, in accordance with NEC Article 330. Minimum size shall be #12 AWG unless specified otherwise.
- C. Wire #8 and larger shall be stranded; #10 and smaller shall be solid. Wire and cable shall have THWN-THHN or XHHW insulation.
- D. Motor control circuits and signal wiring may be #14 if NEC requirements are met. Branch circuits longer than 75' feet for 120 V and 175 feet for 277 V shall be at least #10 from panel to last outlet.
- E. Wiring within light fixtures and other high-temperature equipment shall have 150 degrees C insulation as required by NEC.
- F. Aluminum conductors shall not be used.
- G. Splices and Terminations:
 1. Make splices in branch circuit wiring with UL-listed, solderless connectors rated 600 V, of sizes and types required by manufacturer's recommendations with temperature ratings equal to those of wires. Splice connectors shall be screw-on. Insulate splices with integral covers or with

- plastic or rubber friction tape to preserve characteristics of wire and cable insulation.
2. Provide standard bolt-on lugs with hex screws to attach copper wire and cable to panelboards, switchboards, disconnect switches and electrical equipment.
 3. Make terminations and splices for conductors #6 and larger with corrosion-resistant, high-conductivity pressure indent, hex screw or bolt-clamp connectors, with or without tongues, designed specifically for intended service. Connectors for cables 250 MCM and larger shall have two clamping elements or compression indents. Terminals for bus connections shall have two bolt holes.
 4. Ampacity of splices and connectors shall be equal to those of associated wires and cables.
- H. Provide three-ply marlin twine lacing or self-extinguishing nylon straps with -65 to 350 degrees F range for bundling conductors.

2.05 FEEDER IDENTIFICATION

- A. Provide nonferrous identifying tags or pressure-sensitive labels for cables, feeders, and power circuits in pull boxes, manholes and switchboard rooms, at cable termination and in other locations.
- B. Tags or labels shall be stamped or printed to correspond with markings on Drawings or marked so that feeder or cable may be identified readily. If suspended tags are provided, attach with 1/32-inch diameter nylon 55-pound test monofilament line or slip-free plastic cable lacing unit.

2.06 COLOR CODING

- A. Color code secondary service, feeders and branch circuit conductors as follows:

1.	208/120 Volts	Phase	480/277 Volts
2.	Black	A	Brown
3.	Red	B	Orange
4.	Blue	C	Yellow
5.	White	Neutral	Gray
6.	Green	Ground	Green
- B. Colors shall be factory-applied entire length of conductors by one of the following methods except as noted and limited below:
 1. solid color compound,
 2. solid color coating,
 3. colored stripping (2 stripes 180 degrees apart),
 4. colored bands or hash marks with maximum spacing of 18 inches,

5. colored fibrous covering, or
 6. surface printing every 12 inches, maximum spacing of 18 inches.
- C. Branch circuit conductors #12 and #10 shall have solid color compound, solid color coating. Neutrals and equipment grounds shall have solid compound or solid color coating (white, gray and green), except that neutrals with colored stripe shall be used where required by NEC. Conductor #8 and larger with stripes, bands or hash marks shall have background color other than white, green and gray.
- D. Solid color coating, stripes, bands or hash marks shall be strongly adherent paint or dye, sufficiently wide and clear to be readily distinguishable after installation.
- E. Alternative field-applied color-coding methods may be used for wire #10 or larger, with color code specified in Subparagraph A:
1. Apply $\frac{3}{4}$ inches colored pressure-sensitive plastic tape in half overlapping turns for 6 inches from all terminal points and in boxes in which splices or taps are made. Apply last two laps of tape with no tension. Do not cover cable identification markings.
 2. Identify with nylon, self-extinguishing, self-locking colored cable ties. Ties shall accommodate wire sizes $\frac{1}{16}$ inches through $1\frac{3}{4}$ inches in diameter and shall not be less than 0.18 inches wide. Minimum tensile strength shall be at least 50 lbs. Temperature range shall be -65° F to $+350^{\circ}$ F. Provide three ties to each wire at each terminal point starting 3 inches from terminal and spaced 3 inches apart and three ties to each wire in boxes where splices or taps are made with special tool or pliers, and cut off excess.

2.07 WIRE PULLING EQUIPMENT

- A. Provide polyethylene ropes for pulling wire.
- B. Provide fish wires in telephone conduits and other empty conduit systems required, without splices and with ample exposed lengths at each end.
- C. Provide wire pulling lubricants that meet applicable UL requirements as necessary.

2.08 CABLE SUPPORTS AND BOXES

- A. Provide cable supports and boxes for vertical feeders as required by NEC. Boxes shall be 10-gauge steel plates fastened to angle iron frame with removable covers secured with brass machine screws.
- B. Provide split wedge cable supports with clamps for cable without metallic sheath. Provide basket weave or approved equal cable supports approved by cable manufacturer for cable with metallic sheath. Supports shall be by O.Z./Gedney or approved equal.

2.09 WIRING DEVICES

- A. Provide wiring devices by single manufacturer. Cooper (Division of Crouse-Hinds), Leviton, Bryant, Hubbell or approved equal. Catalog designations of Cooper are specified to establish standards of quality for materials and performance. Devices shall be the color to match existing.
- B. Toggle Switches:
 - 1. Single-pole shall be No. CSB120B, 20A, 120-277 V AC.
 - 2. Double-pole shall be No. CSB220B, 20A, 120-277 V AC.
 - 3. Three-way shall be No. CSB230B, 20A, 120-277 V AC.
- C. Receptacles:
 - 1. Single receptacles shall be No. 1877W, 20A, 2-pole 3W grounding.
 - 2. Duplex shall be No. 5362W, 125V, 20A, 2-pole, 3W grounding.
 - 3. Ground Fault Duplex Receptacle shall be No. XGF20W, 125V, 20A, 2-pole, 3W grounding.

2.10 WIRING DEVICE PLATES

- A. Provide smooth white nylon device plates by Arrow-Hart, Bryant, Hubbell or approved equal.
- B. Nameplate designations for device plates shall be engraved directly on plates and filled in.
- C. Device plates shall be manufacturer of wiring devices.
- D. Receptacle device plates for circuits other than 120 V, 2-wire, shall be engraved with ¼ inch letters, filled red, indicating voltage characteristics and circuit number of outlets.
- E. Outlets shall be flush to surface.
- F. All receptacles shall be provided with labels indicating panel board and circuit number (i.e. PIA-23).

2.11 SAFETY DISCONNECT SWITCHES

- A. Provide quick-make/quick-break safety switches: Type HD, heavy duty, Class 3, Design 3, unless specified otherwise. Provide NEMA 1 or NEMA 12 enclosure for dry applications and NEMA 3R for wet. Switches shall be rated 240 or 600 V minimum as required for voltage of associated circuit and shall be rated in horsepower. Fuses shall interrupt locked rotor current of associated motor or ten times full rates load current, whichever is greater.

- B. Mount switch parts on insulating bases to facilitate replacement from front of switch. Current-carrying parts shall be high-conductivity copper. Contacts shall be silver-tungsten or plated. Provide positive pressure fuse clips and switch operating mechanism suitable for continuous use at rated capacity without auxiliary springs in current path.
- C. Switches shall withstand available fault current or let-through current before operating, without damage or rating change.

2.12 FIRE ALARM SYSTEM

- A. General
 - 1. Provide devices as indicated on contract documents.
 - 2. All devices shall be compatible with existing system manufactured.
- B. Submittals
 - 1. Detailed component and equipment list with model numbers.
 - a. Manufacturer's specification sheets for each item of equipment.
 - b. Confirmation that manufacturer's representative will provide jobsite supervision during installation, perform final testing, and instruct operating personnel on system operation.
 - c. Detailed one-line schematic wiring diagrams of specified system and interconnection wiring.
 - 2. System Operation
 - a. There will be no change to the existing system operation.

2.13 SCAFFOLDS AND STAGING

- A. General: Contractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - Temporary Facilities and Controls and herein.
 - 1. Scaffolding and staging (8'-0") and under required for use by this Contractor pursuant to requirements of Section 01 50 00 - Temporary Facilities and Controls shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this contractor.
 - 2. Each Contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor

pursuant to MGL (Refer to Section 01 50 00 - Temporary Facilities and Controls and as additionally required for dust control).

3. Furnishing portable ladders and mobile platforms for heights of 8'-0" or less AFF, which may be necessary to perform the work of this trade, are the responsibility this Contractor.

2.14 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed Contractor shall be furnished, installed, operated and maintained in safe conditions by this Filed Contractor, as referenced under Section 01 50 00 - Temporary Facilities and Controls.

2.15 LIGHTING SYSTEMS

A. General:

1. Provide lighting fixtures and equipment complete, wired and assembled as specified and shown on Drawings.
2. This specification contains descriptive criteria. Where no manufacturer's name is listed as standard of quality, Architect's decision concerning the conformity of the product to Contract Documents requirements shall be final.
3. In addition to submittals requirements of Part 1 of this Section, shop drawing and product data submittals shall include physical dimensions, specify types and mounting details.
 - a. Equipment and materials that require product sample submittal are shown on Drawings.
 - b. Submit written statement that verifies coordination of fixture mounting with ceiling systems as specified, with date of verification.
4. Where lighting fixtures substitutions are allowed, in addition to submittal requirements, submit photometric report on substituted luminaire, prepared by independent laboratory. Report shall include candela values in at least three planes, except for axially symmetrical luminaires. Candela curves, foot-candle and lumen tables, and iso-footcandle contours are not acceptable. Submit product sample at Architect's request.

B. Ballasts:

1. General:

- a. Provide ballasts by General Electric, Advance, Universal, or approved equal. Ballasts shall be ETL-CMB and UL-listed unless specified or shown on Drawings otherwise.
- b. Ballasts shall have at least 0.9 power factor unless specified otherwise. Input voltage shall be as shown on Drawings.
- c. Furnish manufacturer's two-year warranty, including replacement parts and labor. Date of manufacture shall be stamped on nameplate.
- d. Ballasts shall not contain PCB.

C. Luminaires:

1. General:

- a. Provide factory-wired luminaires that meet UL 57 and ANSI C81 requirements, of dimensions and in locations as shown on Drawings.
- b. Finish shall be uniform with no defects such as whirls, discoloration, sand or dust spots, cracks or chips. Steel rustproofing shall be by five-stage cleaning cycle and iron or zinc phosphate coating with rust inhibitor.
- c. Luminaires in damp or wet locations shall bear correct UL label as shown on Drawings. Luminaries in hazardous locations shall bear UL 885 and UL 1225 labels.
- d. Luminaries that require incandescent or high intensity discharge lamps shall provide adequate ventilation.
- e. Stems for pendant-mounted luminaries shall match luminaries finish. Provide self-aligning joints.
- f. Provide safety chains on luminaries as shown on Drawings. Chains shall support eight times luminaries weight including fixture components. Maximum distance luminaries may fall shall be 1 foot.

D. Lens Diffusers:

1. Provide lenses of at least 1/8" thick, 100% clear acrylic, tinted acrylic or glass as shown on Drawings. Lenses shall not be inverted unless specified otherwise.
2. Acrylic lenses shall meet or exceed Grade 8 requirements of ASTM D-788 Table 2.
3. Acrylic lens prismatic pattern 20 shall have 1/8" square base male cones on base parallel to lens edge. Prism height shall be at least 0.05". Lens shall be KSH-20, or approved equal.

2.16 LIGHTING FIXTURES

- A. Provide lighting fixtures, equipment and components where shown on Drawings, as listed in fixture schedules and as specified, wired and assembled. Provide approved aligner canopies, hangers and other appurtenances as required.
- B. Verify ceiling constructions, and provide fixtures, ballasts, frames, rings and other accessories suitable for construction encountered.
- C. Coordinate installation of fixtures with installation of ceiling materials and suspension system.
 - 1. Ceiling-mounted fixtures shall be supported independent of hung ceiling with threaded rod or bow chain.
 - 2. In no case shall lighting fixtures be suspended from hung ceiling, conduit or duct. Fixtures shall be supported from structural members only.
 - 3. Provide unistrut below ducts from which to hang fixtures when fixture locations coincide with duct runs. Provide threaded rods to support unistrut.
 - 4. Investigate lighting fixture locations and supports to ensure that no interference exists between lighting fixture, supports and other equipment. Correct interferences as directed by Architect.
- D. Refer to fixture schedule for specific lamp requirements.
- E. Provide polyester covers to protect fluorescent fixtures with parabolic louvers during construction.

2.17 CIRCUIT BREAKERS

- A. Provide molded case, bolt-on, thermal-magnetic trip, single, two or three pole branch circuit breakers as shown on Drawings. Multiple pole breakers shall be single handle, common-trip. All circuit breakers shall be rated for switching purposes.
- B. Provide typed panel directions that show use of each circuit and electrical characteristics of panelboard. Directory shall be mounted inside of each panelboard within clear plastic cover.

PART 3 - EXECUTION

3.01 MATERIALS AND WORKMANSHIP

- A. Work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Maintain maximum headroom at all times. Do not run pipes and ducts exposed unless shown exposed on drawings. Material and equipment shall be new and installed according to manufacturer's recommended best practice so that completed installation shall operate safely and efficiently.

3.02 CONTINUITY OF SERVICES

- A. Do not interrupt existing services to existing building without Owner's and Architect's approvals.

3.03 SPECIAL RESPONSIBILITIES

- A. Coordinate work of this Section with work of other Sections.
- B. Provide information about items furnished under this Section to be installed under other Sections, as necessary.
- C. Obtain detailed information from manufacturers of equipment provided under this Section as to proper methods of installation.
- D. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or by Owner.
- E. Keep fully informed of shape, size and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.

3.04 TESTING, INSPECTION AND CLEANING

- A. Test and inspect work provided under this Section as required by Contract Documents, codes, standards and authorities that have jurisdiction, to satisfaction of Architect. Notify Architect and authorities at least 48 hours before testing or inspection. Do not cover work before testing or inspection.
- B. Furnish Architect with certificates of testing and inspection for electrical systems, indicating approval of authorities that have jurisdiction and conformance with requirements of Contract Documents.
- C. Test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required. Insulation resistance between conductors and grounds for secondary distributions systems shall meet NEC requirements.
- D. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to points of use. Test secondary voltages at bus in main switchboard, at panelboards, and at other locations on distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.
- E. Provide necessary testing equipment and testing.

- F. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective material.
- G. Perform high potential DC test on 15 kV equipment and cable as specified and as required by local electric company. Provide services of approved independent testing company, in presence of Architect, Owner and local electric company.
- H. Panelboard interiors shall be cleaned and vacuumed. Equipment with damage to painted finish shall be repaired to Architect's satisfaction.
- I. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

3.05 NAMEPLATES

- A. Provide nameplates in or on panelboards, junction boxes and cabinets, and for special purpose switches, motor disconnect switches, remote control stations, starters or other controls furnished or installed under this Section. Nameplates shall designate equipment controlled and function.
- B. Nameplates shall be laminated black bakelite with ¼ inch high white recessed letters. Nameplates shall be securely attached to the equipment with galvanized screws. Adhesives or cements shall not be used.

3.06 WIRING METHODS

- A. Install wire and cable in approved raceways as specified and as approved by authorities that have jurisdiction. Surface metal raceways shall not be used unless explicitly specified and shown on Drawings. Do not use surface raceways on floor. Do not use armored cable except as approved by local code for lighting and receptacle circuits in suspended ceilings and stud-wall partitions. Homeruns for lighting circuits shall be 3-phase, 4-wire run in conduit.
- B. Wire from point of service connection to receptacles, lighting fixtures, devices, equipment, outlets for future extension, and other electrical apparatus as shown on Drawings. Provide slack wire for connections. Tape ends of wires and provide blank covers for outlet boxes designated for future use.
- C. Conductors #10 and smaller in branch circuit panelboards, signal cabinets, signal control boards, switchboards and motor control centers shall be bundled. Conductors larger than #10 in switchboards, motor control centers and pull boxes shall be cabled in individual circuits.
- D. Two or more conduits installed instead of single conduit shall contain duplicate conductors, including neutrals and ground conductors where required; total

capacity of duplicate conductors shall be at least equal to capacity of conductors replaced.

- E. Follow homerun circuit numbers shown on Drawings to connect circuits to panelboards. Where homerun circuit numbers are not shown on Drawings, divide similar types of connected loads among phase buses so that currents are approximately equal in normal usage. Connect each branch circuit homerun with two or more circuits and common neutral to circuit breaker or switch in three-wire or four-wire branch circuit panelboard so that no two circuits are fed from same bus. Where panelboard cabinets are recessed, provide conduits with sufficient capacity for future conductors for spare branch circuit protective devices and spaces in panelboard; stub up concealed to junction box. Provide extensions above ceiling.
- F. Electrical metallic tubing may be used generally, if approved by local codes, for lighting fixture and receptacle circuits, telephone, inter-communications, signal and instrumentation circuits, and for control circuits. EMT may be used generally, if approved by authorities, in masonry walls, above hung ceilings, in equipment rooms, in mechanical and electrical chases and closets, in exposed locations along ceilings or walls above normal traffic level and where not subject to accidental damage or abuse. Do not run EMT exposed below 8 feet above finished floor. Conduit below 8 feet – 0 inches AFF exposed shall be rigid steel.
- G. Install connectors and couplings as recommended by manufacturers. Compression fittings shall not be used with rigid steel, intermediate metallic or aluminum conduit. Set screw fittings shall not be used with rigid aluminum conduit and shall not be used for other applications, unless specified and approved by Architect. If set-screw connectors are used, tighten to imbed screws in conduit.
- H. Conduit in concrete shall be rigid steel. EMT shall not be installed underground, in slabs on grade, in wet locations, in hazardous areas, or for circuits operating at more than 600 V. Buried metallic conduit shall be rigid steel. Run conduit in slabs above bottom steel reinforcing, below top reinforcing and inside beam stirrup, wall reinforcements and column ties.
- I. Rigid non-metallic conduit as specified in Part 2 of this Section may be used, if approved by local authorities, for installation in concrete slabs when installed as required by NEC and manufacturer's requirements. Penetrations from concrete slabs shall be made with rigid steel conduit and rigid steel conduit fittings only.
- J. Maximum outside diameters of raceways in conduit shall be 1/3 slab thickness. No more than two $\frac{3}{4}$ inches raceways shall cross in floor slab at a single point. Submit raceway crossing locations for approval before pouring slabs and relocate at no expense to Owner as directed by Architect. Lateral spacing of parallel raceways shall be at least 6 inches on centers. Do not run conduit in slab less than 3 inches thick without express approval and direction of Architect.

- K. Raceways with outside diameters larger than $1/3$ slab thickness shall be run concealed in hung ceilings in finished areas, exposed in unfinished Mechanical/Electrical and storage areas, below slabs on grade.
- L. Penetrate waterproof walls of structural slabs and foundation walls only where approved by Architect. Submit proposed penetration points, size openings and penetration methods to Architect for approval.
- M. Provide flexible conduits for connections to electrical equipment and to equipment furnished with elevator equipment that are subject to movement, vibration or misalignment; where available space dictates; and where noise transmission must be eliminated or reduced. Flexible conduit shall be liquid-tight under following conditions:
 - 1. Exterior locations
 - 2. Moisture or humidity-laden atmospheres
 - 3. Corrosive atmospheres
 - 4. Where wash-down operations are possible
 - 5. Where seepage or dripping of oil, grease or water is possible
- N. Run concealed conduit and EMT in as direct lines as possible with minimum number of bends of longest possible radius. Run exposed conduit and EMT parallel to or at right angles to building lines. Ends shall be free from dents or flattening.
- O. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Conduit shall enter and be secured to cabinet, junction box, pull box or outlet box with locknut outside and bushing inside, or with liquid-tight, threaded, self-locking, cold-weld wedge adapter. Provide additional locknut for rigid conduit and wrench-tighten locknut for EMT or flexible conduit where circuit voltage exceeds 250 V. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections. Vertical conduit runs that terminate in bottoms of wall boxes or cabinets shall be protected from entrance of foreign material before installation of conductors.
- P. Size rigid steel conduit, EMT and flexible metallic conduit as required by NEC except as specified or shown on Drawings otherwise. Unless shown otherwise on Drawings, telephone conduits shall be at least 1 inch.
- Q. Check raceway sizes to determine that green equipment ground conductor fits in same raceway with phase and neutral conductors to meet NEC percentage of fill requirements. Increase duct, conduit, tubing and raceway sizes shown or specified as required to accommodate conductors.
- R. Unless specified or shown on Drawings otherwise, install conduit and EMT concealed. Unless specified or shown otherwise, conduit and EMT may be run exposed on unfinished walls and unfurred basement ceilings and in unfinished

penthouses, attics and roof spaces. Provide stand-off clips for conduits on exterior masonry walls.

- S. Install conduit systems complete before drawing in conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.
- T. Expansion/Deflection Fittings: Conduit buried or secured rigidly on opposite sides of building expansion joints and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance of structural movement.
 - 1. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting.
 - 2. Conduits buried in concrete shall cross building expansion joints at right angles; provide expansion fittings as required by manufacturer's instructions. Provide insulated bushings at ends of conduits.
- U. Sealing Fittings: Threaded sealing fittings for rigid steel conduits shall be zinc- or cadmium-coated, cast or malleable iron; sealing fittings for aluminum conduit shall be threaded cast aluminum. Fittings that prevent passage of water vapor shall be continuous drain.
 - 1. Install and seal fittings as required by manufacturer's recommendations. In concealed work, install fittings in flush steel box with blank cover plate.
 - 2. Install sealing fittings at following points, and elsewhere as shown:
 - a. Where conduits enter or leave hazardous areas equipped with explosion-proof lighting fixtures, switches, receptacles and other electrical devices.
 - b. Where conduits pass from warm to cold locations.
 - c. Where required by NEC.
 - 3. Secure conduit system as required by NEC.
- V. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Pull cables that share conduit at same time.
- W. Provide inserts, hangers, anchors and steel supports as necessary.

3.07 GROUNDING

- A. Provide equipment grounding system as shown on Drawings. Equipment grounding system shall be designed so metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate

continuously at ground potential and provide low impedance path for possible ground fault currents.

- B. System shall meet NEC requirements, modified as shown on Drawings and as specified.
- C. Provide separate green insulated equipment grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors.
- D. Determine numbers and sizes of screw terminals for equipment grounding bars in panelboards and other electrical equipment. Provide screw terminals for active circuits, spares and spaces.
- E. Provide green insulated grounding conductor in same raceway with associated phase conductors, as follows:
 - 1. From green ground terminals of receptacles to green 10-32 washer-in-head outlet box machine screw. (Receptacles with special cast boxes and factory-designed and approved ground path do not require separate ground jumper.)
 - 2. From green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to ground terminal in fixture.
 - 3. From green 10-32 washer-in-head machine screw in ceiling outlet box or junction box through flexible metallic conduit to green 10-32 washer-in-head machine screw in switch outlet box in movable partitions.
 - 4. From green 10-32 washer-in-head machine screw in junction box or disconnect switch through flexible metallic conduit to ground terminal in connection box mounted on single phase fractional horsepower motor.
 - 5. From equipment ground bus in motor control center through conduit and flexible metallic conduit to ground terminal in connection box mounted on three-phase motor. Ground conductor motors with separate starters and disconnect devices shall originate at ground bar in panelboard and shall be bonded to each starter and disconnect device enclosure.
 - 6. From switchgear equipment ground bus to panelboard equipment ground bus.
 - 7. From switchgear equipment ground bar to equipment grounding bar on busway.
 - 8. From computer area power panel ground bar for branch circuits as required by NEC. No ground conductor circuit shall exceed 3 ohms resistance to building ground system.
- F. Provide green insulated grounding conductor in nonmetallic conduits or ducts unless specified otherwise.

3.08 COMMISSIONING

- A. Electrical Contractor and all other Contractors required for the work of this Section shall provide all labor, materials and equipment required to assist with the building commissioning of this project in accordance with the requirements outlined in Division 01.

3.09 INSTALLATION OF LIGHT FIXTURES

- A. Coordinate installation of fixtures with installation of ceiling materials and suspension systems.
- B. Do not install fixtures until work of other trades that may damage fixtures is completed.
- C. Investigate lighting fixture locations and supports to ensure that no interference exists with hangers, ducts, sprinklers, pipes and other equipment.
- D. Provide plaster frames for fixtures recessed in gypsum board or plaster ceiling.
- E. Do not suspend or support lighting fixtures or safety chains from hung ceiling conduit or duct. Support fixtures with jack chain or tie-rods, from structural members only.
- F. Provide unistrut below ducts where fixture locations coincide with duct runs. Provide threaded rods to support unistrut.
- G. Luminaries shall be compatible with flexible wiring system.
- H. Where air is supplied or returned through luminaries, coordinate compatibility of fixtures with air boots and attachments.
- I. Patch spray-on fireproofing damaged during installation.
- J. Support surface-mounted luminaries at least two concealed points to prevent rotation.
- K. Fire-rated enclosures necessary for fixture housings above ceiling will be provided under another Section.
- L. Mounting height of suspended or wall-mounted luminaries shall be shown on Drawings.
- M. Locate ceiling-mounted fixtures as shown on reflected ceiling plans. Locate wall- and floor-mounted fixtures as shown on Electrical Drawings.
- N. Coordinate aiming of adjustable fixtures with Architect.

LOWELL POLICE LOCKER ROOMS RENOVATIONS
CITY OF LOWELL
LOWELL, MASSACHUSETTS
CBI JOB NO. CB190850

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

END OF SECTION

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