

WORCESTER HOUSING AUTHORITY
REPLACEMENT OF EXISTING PLUMBING WASTE PIPE RISERS
ELM PARK TOWER APARTMENTS -195 Units
425 Pleasant Street, Worcester, MA 01605

SECTION 15400

PLUMBING

(Filed Sub-Bid Required)

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.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.

1.02 TIME, MANNER AND REQUIREMENTS FOR SUBMITTING SUB-BIDS

- A. Sub-bids for work under this Section shall be for the complete work and shall be filed in a separate sealed envelope with the Awarding Authority at a time and place as stipulated in Document INVITATION TO BID.

- 1. The following should appear on the upper left-hand corner of the envelope:

NAME OF BIDDER: _____
PROJECT: WORCESTER HOUSING AUTHORITY
SUB-BID FOR: Section 15400, PLUMBING

- B. Every sub-bid submitted for work under this Section shall be on forms furnished by the Awarding Authority as required by Section 44F of Chapter 149 of the General Laws, as amended. Sub-bid forms are included in this Project Manual or may be obtained at the office of the Architect.
 - C. Sub-Bids filed with the Awarding Authority shall be accompanied by BID BOND or CASH or CERTIFIED CHECK or TREASURER'S or CASHIER'S CHECK issued by a responsible bank or trust company payable to the Worcester Housing Authority in the amount of five percent (5%) of the sub-bid. A sub-bid accompanied by any other form of bid deposit than those specified will be rejected.

1.03 SUB-BID REQUIREMENTS

- A. Each Sub Bidder shall list in Paragraph E of the "Sub Bid Form" 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 the Sub-Trade requires such listing, provided that, in the absence of as contrary provision in the Specifications, any Sub Bidder may, without listing any bid price, list his own name in said Paragraph E for each such class of work or part thereof and perform that work with persons on his own payroll, if such Sub Bidder, after Sub Bid openings, shows to the satisfaction of the Awarding Authority, that he does customarily perform such class of work or the part thereof with persons on his own payroll and is qualified to do so. This Section of the

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Specifications requires that the following class(es) of work shall be listed in Paragraph E under the conditions herein.

CLASS OF WORK

REFERENCE PARAGRAPHS

None Required Under This Section

1.04 RELATED DOCUMENTS

- A. Include GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS and applicable parts of Division 01 as part of this Section.
- B. 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.
- 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. The following definitions apply to the Drawings and Specifications
 - 1. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
 - 2. Install: The term "install" is used to describe operations at project site including actual "unloading, unpacking, rigging in place, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
 - 3. Provide: The term "provide" means to "furnish and install, complete and ready for intended use."
 - 4. Installer: An "installer" is the contractor or an entity engaged by the contractor, either as an employee, subcontractor, or sub-subcontractor for a performance of a particular construction activity, including installation, erection, application and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
 - 5. Contractor: The term "Contractor" shall mean Plumbing Contractor.

1.05 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. New "single pipe" sanitary and vent systems similar to the So Vent brand system within building including final connections for all new plumbing fixtures. The new sanitary systems shall be taken a point inside the building and connections made to existing sanitary/vent systems.
 - 2. Cleaning, caulking, testing and adjusting of all plumbing fixtures.
 - 3. Furnish access panels for installation by the related trades of surfaces in which they are installed.
 - 4. Core drilling, patching and sealing of existing walls and floors.
 - 5. Complete balancing and testing of all plumbing systems.
 - 6. Furnish, set up and maintain all derricks, hoisting machinery, scaffolds, staging and planking as required for the work.

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7. Coordination with all existing conditions at the site.
8. Connections to existing plumbing services.

C. General

1. Cleanouts
2. Sleeves, inserts, hangers and accessories
3. Pipe identification tags
4. Fire-safing at piping and sleeves
5. Cleaning, testing and balancing
6. Cutting and patching
7. Access panels
8. Supplementary steel for piping and equipment supports
9. Operating and maintenance manuals
10. Guarantee
11. Shop drawings and reproducible record drawings
12. Complete coordination drawings
13. 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.
14. 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.
15. Cutting and Patching as outlined in this section.
16. Demolition of existing sanitary piping
17. Coordination of all piping authorized factory representative.

D. Scope Requirements

1. It is the intent of this project that a "single pipe" waste and vent system is utilized. It shall be similar or equal to the So Vent piping system. Contractor shall coordinate with Factory Rep. to review all installations, shop drawings and submittals of project.
2. The system is intended to be installed parallel to the existing waste and vent stacks. Each unit may be tied into the new system individually thus keeping disruption to the tenants to a minimum. The existing building is occupied and the contractor shall take extreme care to limit disruption to tenants as much as possible. Under no circumstances shall any tenant be kept without plumbing services after the end of a working day. All shut downs and "tie ins" shall be closely coordinated with the owner/engineer. No work affecting tenants shall commence without the prior approval of the owner/engineer.

1.06 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 02070 – SELECTIVE DEMOLITION
2. Section 06200 - FINISH CARPENTRY
3. Section 06100 – ROUGH CARPENTRY

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4. Section 09900 – PAINTING

1.07 REFERENCES

- A. For products or workmanship specified by association, trade, 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
 - 2. ASME American Society of Mechanical Engineers
 - 3. ASTM American Society for Testing and Materials
 - 4. AWWA American Water Works Association
 - 5. FM Factory Mutual System
 - 6. IEEE Institute of Electrical & Electronics Engineers
 - 7. CISPI Cast Iron Soil Pipe Institute
 - 8. PDI Plumbing and Drainage Institute
 - 9. NEMA National Electrical Manufacturer's Association
 - 10. NFPA National Fire Protection Association
 - 11. UL Underwriters' Laboratories, Inc.
 - 12. OSHA Occupational Safety and Health Administration
 - 13. MSS Manufacturers Standardization Society

1.08 SUBMITTALS

- A. Conform to the requirements of the submittals section 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. Hangers and Supports
 - 2. Insulation
 - 3. Piping, Fittings, Unions and Couplings
 - 4. Access Panels
 - 5. Cleanouts
 - 6. Plumbing Coordination Drawings
- 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.

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- F. Submit Material Safety Data Sheets (MSD) on each product with submittal.

1.09 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, NFPA, Massachusetts Architectural Access Board and any and all state and local requirements of the Authority Having Jurisdiction.
- B. All materials and installation provided under this Contract shall be approved for use in the State of Massachusetts, and done in strict accordance with the Massachusetts State Plumbing Code and NFPA.
- 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.

1.10 SEQUENCING AND SCHEDULING

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

1.11 RECORD DRAWINGS

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

1.12 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.

1.13 COORDINATION AND RESPONSIBILITY

- A. The structure and its appurtenances, clearances and the related services, such as 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 the 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.
- B. Where the Plumbing Contractor proposes to use an item of material or equipment other than that shown or specified in the Contract Documents, he shall assume the cost of and entire responsibility for any change in his work from the work as shown or

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specified occasioned by approval of such item. In addition, the Plumbing Contractor shall make all such arrangements and assume all cost occasioned by changes in the work of other trades that may be required in order to install the approved substitution; such changes shall not be a matter for subsequent Change Order increasing the Contract Sum.

- C. The contractor shall be responsible for visiting the site and reviewing the drawings to become familiar with the scope of work and the existing conditions. The contractor shall coordinate with all trades and all existing conditions prior to the commencement of work, in order to insure that no interferences occur with other trades or with existing conditions, and to insure that the work of this section will fit into the space.

1.14 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.

1.15 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.

1.16 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.

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- 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 Plumbing 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.

1.17 OPERATION AND MAINTENANCE MANUALS

- A. Prepare and submit maintenance and operating manuals as described in, PROJECT CLOSEOUT, section of specifications. Submit six (6) complete sets of operation and maintenance manuals. Submit a separate CD with scanned copies of the Maintenance & Operations Manuals. The contractor shall also provide a separate CD with scanned copies of the Maintenance & Operational 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.
 - 4. Manufacturer's Literature:
 - a. All items as listed under Submittals.

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1.18 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.

1.19 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 Sub-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

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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 07.

1.20 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.

1.21 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.

1.22 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.

1.23 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

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other sections, assist in working out space conditions to make satisfactory adjustment. Prepare and submit for approval 3/8 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.

1.24 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.

1.25 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.

1.26 SUPERVISION

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

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1.27 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 01.
- D. Thoroughly inspect all plumbing equipment and materials upon receipt at the job site for damage and correctness.

1.28 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.

1.29 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 08. 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. 24" x 24").

1.30 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.

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1.31 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.

1.32 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 sub-contractor.

1.33 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.

1.34 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.

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- 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 3/8 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 insure that all work shall fit in the spaces. Contractor shall be responsible for compiling a full set of coordination drawings. The plumbing contractor shall make reasonable changes to the contract drawings in order to accommodate existing conditions without extra charge. No work shall commence until a full set of coordination drawings has been submitted and approved by the Owner, So Vent Representative and Engineer.

1.35 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" 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 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.
- C. Plumbing Coordination Drawings
 - 1. The Plumbing Sub-Contractor shall prepare Coordination Drawings showing all work to be installed as part of Section 15400. The Plumbing Coordination Drawings shall show all equipment, work, pipes, sleeves, inserts, and supports.

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2. The Plumbing Sub-Contractor, after showing all of the Plumbing work, shall forward the reproducible coordination drawings to the General Contractor.
3. The Plumbing Sub-Contractor shall attend a series of meetings arranged by the Engineer to resolve any real or apparent interferences or conflicts with the work of the other contractors or with ceiling heights shown on the drawings.
4. The Plumbing Sub-Contractor shall then make adjustments to his work on the Coordination Drawings to resolve any real or apparent interferences or conflicts and forward to the Contractor.
5. After any real or apparent interferences and conflicts have been incorporated into the Coordination Drawings, the General Contractor shall prepare the final Coordination Drawings and submit to the Engineer.
6. The Plumbing Sub-Contractor shall not install any of his work prior to the preparation of the final Coordination Drawings. If Plumbing work proceeds prior to the final Coordination Drawings, any change to the Plumbing work to correct the interferences and conflicts which result will be made by the Plumbing Sub-Contractor at no additional cost to the Owner.
7. Coordination Drawings are for the Plumbing Sub-Contractor's and Architect's use during construction and shall not be construed as replacing any shop, "as-built", or Record Drawings required elsewhere in these Contract Documents.
8. Review of Coordination Drawings shall not relieve the Plumbing Sub-Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirements of the Contract.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

- A. Materials and equipment shall be of the best quality manufacture, new, unused and free from all defects, and burrs. All piping shall be de-burred before installation.
- B. Reference to specifications or recognized authorities to establish basis of quality shall be latest edition in force at date of bidding.

2.02 SANITARY WASTE, SO VENT AND VENT PIPE AND FITTINGS

- A. Buried or under floor shall meet the following:
 1. Buried or under floor shall be service weight cast-iron soil pipe and fittings, coated tar or asphaltum. Joints to be made mechanical joint with resilient gaskets.
 2. Marking - Each length of pipe and each fitting shall be plainly marked with the manufacturer's initials or registered trademark by which he can be readily identified, and with letters to indicate the proper classification, as follows: SV Service Weight.
 3. Coating - The pipe and fittings shall be uniformly coated with coal tar pitch, or similar bituminous material suitable for the purpose, that is adherent and without a tendency to scale or become brittle. The coating shall be applied to all surfaces, except in threaded openings.
 4. The cast-iron pipe shall meet the specifications of the seal of the Cast-Iron Soil Pipe Institute.
- B. Above grade shall be one of the following:
 1. Service weight cast iron soil pipe and fittings, tarred or plain. Joints shall be made with mechanical joint with resilient gaskets.

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2. Hubless cast iron soil pipe and fittings, manufactured in accordance with CISPI Standard 301--75, joined with a 4 band stainless steel clamp from a list of approved clamps and installed in accordance with CISPI Pamphlet Designation 310-78. Pipe 8" and larger shall have pipe clamps and rods at each fitting.
3. Copper pipe with cast brass drainage fittings.
4. Hard drawn Type DWV copper tubing ASTM B 306, with cast brass or wrought copper drainage pattern fittings for piping up to 2" size only.
5. PVC shall not be used on the project per code.

2.03 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.

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- 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.

2.04 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.

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- 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.

2.05 CLEANOUTS

- A. Bodies of cleanout ferrules in hub and spigot or no-hub piping shall be standard pipe size conforming in thickness to that required for pipe and fittings, and shall extend not less than 3/4 inch high. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of the same size as the pipe line. Cleanouts in threaded waste piping shall be cast iron drainage "T" pattern 90 degree branch fittings with extra heavy brass screw plugs of the same size as the pipe.
- B. Floor cleanouts shall be J.R. Smith, Zurn, or Wade, heavy duty cast iron body with ductile iron cover.
- C. Exterior cleanouts (GCO) to grade shall be same as for floor cleanouts and shall be encased in concrete at a minimum of 6" beyond the greatest outside dimension and a minimum of 6" depth. Top of cleanout shall be set 1/2" below finished grade and concrete collar shall be shaped to finished grade.
- D. Wall cleanouts, ZN1445-1 cast iron supreme cleanout tee with cadmium plated plug, lead seal and round stainless steel access cover with securing screw, or approved equal.
- E. Provide owner with three (3) wrenches for removing flush cleanout plugs.
- F. Plastic Cleanout plugs will not be allowed.

PART 3 - EXECUTION

3.01 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.
 - 3. The Plumbing Contractor shall label all equipment. Subcontractors will provide The Owner with excel spreadsheets of all items to be labeled, The Owner will assign numbers, assign names, print out labels and provide subcontractors with labels. Subcontractor will then affix the labels to the equipment. Brass tags are eliminated. As-builts and manuals will reference Stem Middle School provided numbers and names.
- 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.

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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' 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
Sanitary	Sanitary	Green
Vent	Vent	Green

5. In general, a 2" high legend shall be used for pipe lines 4" diameter and larger, and a 3/4" 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.

3.02 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

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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. Sanitary and Vent (Waste and Vent) Piping Systems:

- a. Before the installation of fixtures, and equipment each system including vents shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the vent stack or roof drain of each system above the roof where practical. Each system shall hold this water for four hours without a drop in water level.
- b. Where a portion of the system is to be tested, the test shall be conducted in the same manner as specified herein for the entire system, except a vertical sack ten feet above the highest horizontal line to be tested may be installed, and filled with water to maintain sufficient pressure. A pump may be used to supply the required pressure. The pressure shall be maintained for a minimum of four hours for sufficient time to permit inspection of all joints.

3.03 SPECIAL TOOLS

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

3.04 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.

3.05 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.

3.06 SYSTEMS

- A. Sanitary, and Vent 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. At times when work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipe or fittings. Pipe laid through rock excavation shall rest on a six inch of well compacted sand.

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3. The Sanitary and Acid (waste and vent), and storm drainage piping three inches and smaller in diameter shall pitch a minimum of ¼ inch per foot, and piping four inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.
4. The vent stacks shall be connected as shown and extended through the roof. Waste and vent pipes shall be concealed, unless otherwise noted. All acid vent systems shall be kept separate from the sanitary vent systems.
5. Branch connections to each drainage system shall be made with "Wye" and long turn "Tee Wye" fittings. Installation of short radius ¼ bends, common offsets, double hub fittings and saddles will not be approved. Only fittings conforming to the Code shall be installed.
6. 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.
7. Every fixture, unless otherwise noted, shall be separately trapped and the traps must be vented, unless an approved battery or wet vented system is being installed. Floor drains shall be considered as a fixture.
8. Vents shall be connected to the discharge of each trap system, then carried individually to a point above the flood level of the fixture before connecting with any other vent pipes. Pitch the branch vents back to the fixtures.
9. Collect individual vent pipe together in branch vent lines and connect to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The vents passing through the roof shall be a minimum size of one inch larger than connected vent stack. All acid vent systems shall be kept separate from Sanitary vent systems and shall be carried up thru the roof separately.
10. Cleanouts shall be provided in drainage piping at changes in directions, at foot of stacks or other required points so that all portions of the lines will be readily accessible for cleaning or rodding out.
11. Cleanouts shall be of the same size as the pipe installed in up to four inches in diameter and not less than four inches in diameter for piping larger than four inches in diameter.
12. The maximum horizontal distance between cleanouts; in piping four inches in diameter and smaller shall not be more than 50 feet apart; in piping five inches in diameter and larger shall not be more than 100 feet apart.
13. Traps on sanitary piping not integral with fixtures and in accessible locations shall be provided with a brass trap screw protected by the water seal, and will be regarded as a cleanout.
14. Test tees with brass cleanout plugs shall be provided at the foot of all vertical waste and storm drainage stacks and at each floor. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finished wall and a wall plate shall be provided.

B. Buried Sanitary and Vent Piping

1. All pipes shall be accurately laid to lines and elevations shown on the drawing with particular care so that there are no sags in the slope and that a true and even surface is given to the invert. No pipe shall be covered with backfill until it has been approved by the Contractor and the governing authorities.
2. Sewer pipe shall be laid in a straight line and to uniform rate of grade as shown on drawings. Each length shall be checked for line and grade before competing joint.
3. Pipe bedding shall be in accordance with the Massachusetts State Plumbing Code.
4. Pipe joints and jointing material shall be made in accordance with the manufacturer's recommendations.

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5. Promptly install all piping after the excavation or cutting of same has been done, with all openings to be left overnight or longer, closed tightly.
6. Excavation for all underground lines shall be kept open until the drainage systems or portions thereof have been inspected, tested and approved.
7. If an inspection of the completed sanitary gravity sewers or any part thereof shows any manholes, pipes, or joints which allow the infiltration of water, the defective work or material shall be replaced or repaired as directed by the Owner's Representative or Architect/Engineer.

3.07 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation

1. Install piping approximately as shown on the drawings and 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. Rough-ins at lavatories shall be centered at fixture.
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 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 1 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.

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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	6	
.75	8	6	
1.00	10	6	
1.25	10	10	
1.50	10	10	
2.00	10	10	
2.50	10	10	
3.00	10	10	
3.50	10	10	
4.00	10	10	
5.00	10		
6.00	10		
8.00	10		

3. Maximum spacing of hangers on soil pipe shall be five feet or at each fitting on straight lengths to maximum of 10' and hangers shall be provided at either side of all changes in direction. Vertical Hanger rods to support piping from the structure or supplementary steel shall not exceed four feet in total length vertically, this Contractor shall provide factory fabricated channels and all associated accessories.
4. 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.
5. 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.
6. Hangers, in general, for all horizontal piping shall be A Band type hangers for piping up to 4' size and Clevis type for piping 5" and larger. 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.
7. 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.
8. 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.
9. Lock nuts or retaining straps shall be provided with all beam clamps.
10. All supplementary steel including factory fabricated channels and associated accessories, including 12 inch long sheet metal shields, throughout both

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suspended and floor mounted shall be provided by this Contractor and shall be subject to the approval of the Architect/Engineer.

11. Hangers shall not pierce the insulation on any insulated pipe except when prior approval is given.
12. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.
13. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of galvanized paint immediately after erection.
14. 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.
15. All piping shall be independently supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.
16. Installation of hangers which permit wide lateral motion of any pipe will not be acceptable.
17. All hangers in contact with uninsulated piping shall be compatible with piping material.
18. Seismic hangers and bracing shall comply with local Building Codes.

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.

3.08 RECYCLING/DISPOSAL

- A. The contractor shall perform all necessary procedures in accordance with Specifications Section 02070.

3.09 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.

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- D. The Contractor shall label all equipment. Subcontractors will provide The Owner with excel spreadsheets of all items to be labeled, The Owner will assign numbers, assign names, print out labels and provide subcontractors with labels. Subcontractor will then affix the labels to the equipment. Brass tags are eliminated. As-builts and manuals will reference Elm Park Towers provided numbers and names.

END OF SECTION