

SECTION 15100

MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SPECIAL NOTICE

- A. Each contractor shall read all relevant documents, become familiar with the job, the scope of work type of general construction architectural, structural, mechanical and electrical drawings and the specifications. Each contractor shall also familiarize himself with the purpose for which these documents have been prepared and shall become cognizant of all the details involved. Each contractor shall coordinate his work with that of others to the end that unnecessary delays be avoided.
- B. The term “contractor” used in this section of the specification shall mean the contractor whose work is covered by this section.
- C. When the term “Engineer” is used in this section of the specification, it shall mean the consulting mechanical engineer.

1.02 FLAME SPREAD PROPERTIES OF MATERIALS

- A. All materials and adhesives used for acoustical linings, jackets and insulation shall comply with requirements of NFPA 90A and 90B and UL guide no. 40 V.8.15. Products exceeding a flame spread rating of 25, or a smoke developed rating of 50, as determined by ASTM Test Method E-84 are prohibited. Adhesives and sealers shall be fire retardant and fire resistant when dry. Flame proofing treatments which are subject to decomposition, deterioration, or the effects of moisture are prohibited.

PART 2 - PRODUCTS

2.01 PIPE HANGERS AND SUPPORTS

- A. All horizontal runs of piping shall be suspended from the structural members above by means of approved hangers spaced as scheduled. Supports and hangers shall be installed to permit free expansion and contraction, the piping shall be guided and firmly anchored. No piping shall be self-supporting nor shall it be supported from the equipment connections or the suspension system furnished for suspended ceilings.
- B. All hangers shall be properly sized to fit the pipe or the insulation around the pipe which they are supporting. All hangers shall bear the name of the manufacturer by whom they are made. Pipe hangers shall be formed steel clevis type hanger with adjustable attachment to hanger rod. Hangers shall be properly sized to support weight of piping under operating conditions as recommended in the manufacturers’ published literature. For uninsulated copper or brass piping, use hangers as specified above except that they shall be copper plated or plastic sheathed wherever they will be in

contact with the copper pipe.

- C. Hangers shall be fastened to the construction by the use of malleable iron adjustable clamps, properly designed and sized for steel encountered and installed with lock nuts or bolts securely tightened. Hangers, rollers, inserts, beam clamps and riser clamps shall be standard products of the same recognized manufacturer.
- D. All miscellaneous steel necessary for supporting the pipe systems from pipe hangers shall be included as part of this section of the work. Necessary trapeze, rods, bolts and accessories, clamps, weld clips, angle iron brackets or other approved means shall be used for attaching supporting steel to the building construction. Where additional steel members are required for hanging the lines in areas with special conditions, the steel work shall be provided as part of this contract.
- E. Each fitting and length of cast iron pipe shall be separately supported by installing the pipe hanger immediately behind the hub. Generally hangers shall be on 5 foot centers, but if 10 foot length of cast iron pipe is used, hangers may be spaced 10 foot on centers
- F. All plastic piping systems such PVC, polypropylene and fiberglass reinforced epoxy unless otherwise specified or detailed shall be supported in full accordance with the manufacturer's published instructions. Installation bulletins shall be submitted with shop drawings.

2.02 FLOOR AND CEILING PLATES

- A. In each finished space, furnish a chromium plated sectional escutcheon on each pipe or hanger rod penetrating a wall, floor or ceiling. Escutcheons shall be sized to fit snugly to all lines and where the lines are insulated, the escutcheons shall be fit snugly over the insulation. Where required, these plates shall be provided with set screws so that they shall fit snugly against the finished surface. Furnish a galvanized or aluminum collar and flange on all ducts passing through floors, walls or ceilings.

2.03 ACCESS DOORS

- A. Each subcontractor, under the mechanical sections of the work, shall furnish and turn over to the General Contractor for installation access doors as required to operate and service all equipment and valves furnished and installed by him. Access doors shall be of the size indicated on the drawings or required for proper access to equipment. See Section 09280 – Gypsum Board Assemblies for details.
- B. Approved Manufacturers: Milcor, Zurn, Wade, Josam.

2.04 VALVES AND COCKS

- A. Valves and cocks shall be furnished and installed in all branches serving more than one piece of equipment such as pumps, tanks, coils, etc. for shut-off branch mains, eliminating the necessity of interrupting service to the entire building structure for maintenance purposes and where indicated. Valves shall be installed with the best workmanship and appearance and grouping so that all parts are easily accessible.

Manufacturer's figure numbers are specified to indicate type and quality and construction and products of approved manufacturers may be substituted for those specific number shown. Valves for similar service shall be of the same manufacturer. Pressure rating specified for valves are steam working pressure regardless of the services for which used except where noted as WWP.

B. Sizes:

2 1/2" and Smaller

Gate 125 # Crane Co. #428

Valve BB, Screwed

Globe 300# Crane Co. #7

Valves BB, Union Bonnet

Check 125# Crane Co. #34

Valves BB, Screwed

PVC Valves to be true union ball valves

C. Gas Cocks

1/4 inch to 1 inch inclusive, Crane #289

1 1/4 inch to 2 inches inclusive, Crane #272

2 1/2 inches to 4 inches, Crane #324

D. Hose Bibbs

Screw End

Solder End

Hose Bibbs Nibco #760

Nibco #70

E. Approved Manufacturers: Crane, Homestead, Jenkins, Kennedy, Rockwell, Stockham, Walworth, Nibco, Wolverine and Hammond.

2.05 COMBINATION TEMPERATURE AND PRESSURE RELIEF VALVES

A. Combination temperature and pressure relief valves shall be furnished and installed on all hot water tanks and heaters. Valves shall be constructed and rated in accordance with ASME standards. Valves shall have cast iron bodies, shall be of the diaphragm type, constructed with stainless steel spring. All units shall be field adjustable set to relieve above the operating pressure of the system, but not higher than the design pressure of the tank. Relief connections shall be piped to the nearest floor drain.

B. Approved Manufacturers: Bell & Gossett, Taco, Thrust, Watts, Spence, McDonnell and Miller.

2.06 UNIONS

A. Unions shall be installed on each side of each piece of equipment and each automatic control valve in locations that will permit easy removal of equipment or valve for service. Unions shall not be located in concealed spaces. Unions for copper piping

systems shall be similar to Walworth Figure No. 3677 and unions for steel piping shall be similar to Walworth Figure No. 771B malleable iron union with bronze to iron seat.

- B. Approved Manufacturers: Crane, Jenkins, Rockwell and Walworth.

2.07 STRAINERS

- A. Strainers shall be of the basket or wye type in sizes as indicated on the drawings and shall be provided with 1/2 inch valved drain and unless the strainer design is devoid of air pockets, a 1/4 inch air vent cock.
- B. All strainers shall have cast iron or bronze bodies of ample strength for the pressure to which they shall be subjected, removable cylindrical or conical screens of nickel, copper or brass and suitable flanges or tappings to connect with the piping they serve. Strainers 2 1/2 inches and larger shall be provided with flanged covers.
- C. The free area of each screen shall not be less than three times the area of the strainer inlet and the mesh size shall be suitable for the service intended.
- D. Approved Manufacturers: Armstrong, Cash, Crane, Keckley, McAlear, Mueller, Sarco.

2.08 AIR CHAMBERS

- A. Install one air chamber on each hot water and each cold water pipe to each plumbing fixture or behind each group of plumbing fixtures. Air chambers shall be constructed from copper pipe. If one air chamber is installed on each hot and cold water pipe to each plumbing fixture, it shall be the full size of the supply and 18 inches tall, properly capped; if one is furnished for each group it shall be 2 inch pipe, 24 inches tall. At the subcontractor's option, he may use factory fabricated chambers with volume at least equal to those herein specified for each type installation.
- B. Approved Manufacturers: Nibco, Wolverine.

2.09 IDENTIFICATION AND LABELING

- A. General: Make it possible for the personnel operating and maintaining the equipment and systems in this project readily identify the various pieces of equipment, valves, piping, etc., by marking them. All items of equipment such as fans, pumps, etc., shall be clearly, marked using engraved nameplates as here-in-after specified.
- B. Equipment Nameplates: All items of mechanical and electrical equipment shall be identified by the attachment of engraved nameplates constructed from laminated phenolic plastic, at least 1/16" thick, 3-ply, with black surfaces and white core. Engraving shall be condensed gothic, at least 1/2" high, appropriately spaced. Nomenclature on the label shall include the name of the item, its mark number, area, space, or equipment served, and other pertinent information.
- C. Valve Tags: Provide and install identification tags sequentially numbered. These tags are to be affixed to only those valves of which the function are not obvious. For

example, it would not be expected that valves at a pump in a machine room would be tagged. These tags shall be 1/8" thick brass discs, 1-1/2" in diameter. Each tag shall be attached to its valve with copper clad annealed iron wire or other approved material. Valves above the ceilings shall have a red, 1/2" round or square, press tape marking on the ceiling access panel or the tee bar at lift-out ceiling panel access.

D. Pipe Identification Markers: In addition, pipe runs throughout the building including those lift-out ceilings, under floor, and those exposed to view when access doors or access panels are opened, shall be identified by means of Brady Markers. Concealed areas, for purposes of this identification section, are those areas which cannot be seen except by demolition of the building elements. Markers shall be made of laminated plastics and shall have acrylic plastic over coating to shed dirt, grease, and, moisture. In addition to the pipe markers, arrow markers shall be used to indicate the direction of flow. The following specific instruction shall apply to the application of these markers.

1. Provide a pipe marker at each valve to indicate proper identification of pipe contents. Where several valves exist on one header, it is necessary to mark only the header.
2. Provide an arrow marker with each pipe marker pointing away from the pipe marker to indicate direction of flow.
3. Provide a double-ended arrow marker when flow can be in either or both directions.
4. Provide a pipe marker and arrow marker at every point of pipe entry or exit where the lines go through a wall or service column.
5. Provide pipe markers and arrow markers at intervals not exceeding 5 feet.
6. Markers shall be located on the two lower quarters of the pipe where view is unobstructed.
7. Use Brady Marker with 2" letter height on pipes with outside diameters (including insulation) of 3" or more. Use 1" letter height on all pipes with outside diameters less than 3".
8. Brady Markers shall conform to ASA A-13 "Scheme for the Identification of Piping Systems". Arrow markers must have the same ASA background colors as their companion pipe markers.
9. Brady Markers shall have a 3/4" pressure sensitive adhesive strip on the inside edge of each marker to seal the marker to itself.

PART 3 - EXECUTION

3.01 EQUIPMENT FOUNDATIONS

- A. All concrete equipment foundations and bases required for the installation of mechanical work hereinafter specified will be furnished and installed by the General Contractor. Each subcontractor shall be responsible for the proper coordination of his equipment with these bases. He shall furnish all anchor bolts and other accessories required for casting bases and setting of all sleeves and/or anchor bolts.
- B. After equipment is set on concrete bases, the equipment shall be fully grouted to the base filing all void spaces with a non-shrinking grout.
- C. All roof top equipment shall be properly bolted or fastened to the structural steel framework to prevent movement under high wind and adverse weather conditions.
- D. Curbs shall be installed around the perimeter of roof top equipment.

3.02 EXCAVATION AND BACKFILL

- A. All necessary excavation and backfill for the installation of the mechanical work shall be accomplished by each subcontractor under his phase of the work. All such work shall be included regardless of the type of materials encountered in the excavation. All excavation on this project shall be performed in accordance with applicable sections of Division 2 of the specifications or this article of the specification, whichever is the most stringent.
- B. Trenches for all underground piping shall be excavated to the required depths. The bottoms of the trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipes resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depths of 6 inches below the bottom of the pipe and before laying the pipe, the space between the bottom of the pipe and rock surface shall be filled with gravel and thoroughly tamped. Pipe laid in trenches dug in fill shall be supported down to load bearing undisturbed soil. After the pipes have been tested, inspected and approved by the Engineer and the local inspection authorities, the trenches shall be backfilled with clean dirt as follows:
- C. Backfill shall be installed in layers 12 inches deep, adequately tamped and wetted down or flushed before the second layer of earth is laid in place. This process shall be continued until the trenches are filled. No roots, rocks or foreign material of any description shall be used for backfill by this subcontractor and any excess materials and debris shall be removed from the site by this subcontractor. Any special backfill material shall be provided as hereinafter specified and as shown on the drawings.
- D. All excavating and backfilling shall be done in a manner so as not to disturb adjacent structure and any shoring required shall be furnished.

3.03 OPENING AND RECLOSING OF CONCRETE FLOORS AND WALKS

- A. Where excavation requires the opening of existing concrete floors, walks, or other paved areas, the pavement shall be cut as required to install new lines and make connections to existing lines. The size of the cut shall be held to a minimum consistent with the work to be accomplished. After the installation of the new work is completed,

the excavation shall be properly backfilled to the level required for the replacement of paving. All concrete work for the finishing of these openings will be performed by the General Contractor.

3.04 SCAFFOLDING, RIGGING AND HOISTING

- A. Each contractor shall furnish all scaffolding as required for the installation of his work. He shall either arrange with the General Contractor for servicing in connection with any rigging and hoisting required to provide his own equipment to hoist apparatus to be installed by him into place. Each contractor shall see that any equipment too large to permit passage through normal doorways and access ways is brought to the job and set in place before the mechanical spaces are enclosed. All apparatus not delivered in this manner shall be disassembled and reassembled in the proper location. Equipment specified to be factory assembled and tested prior to shipment not be disassembled for shipment to an installation into the building.

3.05 JOINING OF PIPING SYSTEMS

- A. Cast iron piping systems shall be joined with lead and oakum, pre-formed neoprene joints or no-hub connectors at the subcontractor's option, as allowed by code. If caulked joints are used, spigots shall be placed in the bell and properly centered and lined in piping before packing starts. Joints shall then be properly packed with dry oakum and then caulked with not less than one pound of lead for each one inch pipe diameter. Lead shall be poured and caulked in layers and then faced flush with hub. Piping shall be carefully handled after joint is made to insure that jointing and material are not damaged.
- B. Copper piping systems shall be joined with solder joints except that water distribution systems buried below building slabs shall be joined with compression type fittings.

For solder type joints, the tubing shall be cut smooth and square and all burrs removed with a reamer and when necessary, tubing shall be rounded out with a sizing tool. All surfaces shall be properly cleaned by polishing both cup of fitting and the tube end with steel wool or fine sand cloth. After cleaning, flux shall be applied evenly to male end of tubing and shall be inserted into the fitting, revolving the fitting once or twice on the tubing end to spread the flux evenly. After inserting tubing in cup of fitting, apply flame to outside of cup only. do not apply solder until after the fitting and pipe have reached proper heat. After connection is made, remove excess solder with brush and wipe clean. Solder shall be recommended by the manufacturer for the pressures involved, but shall generally be 95 - 5 hard solder. Refrigerant piping shall be joined as hereinafter specified for that particular application.

- C. Threaded and coupled piping systems shall be joined with properly lubricated screwed joints. Pipe shall be cut smooth and square and all burrs shall be removed with a reamer. Tapered threads shall be properly cut on the male end of the pipe and shall be a sufficient number so that when the pipe is pulled up tight in the coupling, at least three full threads remain exposed. Joints shall be made tight with graphite and oil applied to the pipe threads only and not to the fittings. No pipe thread caulking compound shall be used. Where chromium plated piping and fittings are involved, they shall be made tight

using strap wrench. Completed chromium plated piping shall not show any wrench marks on piping or fittings. All piping so marred shall be removed and replaced before acceptance of the job. On galvanized piping systems after the piping has been fully assembled and tested, all exposed threads shall be painted with a heavy coat of red lead or other rust inhibitor paint.

- D. All mechanical, no-hub and no-ring type sockets shall be installed in full accordance with manufacturer's published directions, whose instructions shall be submitted to the Engineer for approval before proceeding with the installation. Engineer's approval of this data will not absolve the subcontractor from any guarantees and required tests.
- E. Plastic piping systems, PVC, polyethylene, ABS, or polypropylene shall be joined by the use of socket type plastic fittings of the same material with either solvent cement and/or heat of fusion type joints. All piping shall be cut smooth and square, all burrs removed, and all surfaces properly cleaned. Solvent cement shall be of the type as recommended by the pipe manufacturer and all procedures shall be in accordance with manufacturer's published directions. Pipe shall be used on PVC fittings.

3.06 VIBRATION ISOLATION

- A. Transmission of vibration or structural borne noise to occupied areas by equipment installed by the contractor will not be permitted. Contractor shall furnish for approval, data showing disturbing frequency, supported weight, static deflection, efficiency and calculations supporting same for each isolator he proposes to use. Equipment shall be manufactured by Amber-Booth, Korfund, Mason Industries, Vibration Eliminator, Vibration Mounting, or Consolidated Kinetics Corporation.
- B. All isolators shall be selected and certified, using published data, to limit vibration transmission to 10% for equipment located on floors in direct contact with grade and 5% for equipment located other than the above. Should any noise or vibrations be objectionable to the Engineer and/or Owner, field instrumentation tests and measurements shall be made by the isolator manufacturer or his representative to determine the source and cause of such disturbance. Any non-compliance with these specifications shall be corrected by the contractor in a manner satisfactory to the Engineer at no additional cost to the Architect, Engineer or Owner.

END OF SECTION