SECTION 224000 - PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

A. All work specified in this Section is governed by the Mechanical General Section 230100.

B. This Section 224000 and the accompanying drawings cover the provision of all labor, equipment, appliances, and materials and performing all operations in connection with the construction of the plumbing systems as specified herein and as shown. These systems include, but are not limited to, the following:

1. Sanitary waste and vent systems.
2. Domestic water systems.
3. Storm drainage systems.
4. Natural gas systems

C. Provide all final plumbing connections to all equipment furnished by Owner.

D. Provide gate valve and reduced pressure backflow preventer or vacuum breaker at the service entrance and at those connections (especially to kitchen equipment) required by local plumbing code.

1.2 INTENT

A. It is the intent of this Section of the specifications to provide complete and operable plumbing systems as shown and specified which are free of leaks, properly vented, free of unreasonable noise, vibration and sweating, and fabricated so as to fit the space allotted and to exhibit a minimum resistance to fluid flow.

B. The word "piping" is defined to mean all piping, fittings, joints, hangers, coatings, valves, cocks, insulation and accessories necessary for the plumbing systems described, shown and specified.

1.3 GENERAL REQUIREMENTS

A. Provide all reducing fittings, flanges, couplings and unions of the size and type of material to match the piping connections at each fixture, piece of equipment, valve and accessory.

B. Union joints, couplings or flanges shall be provided in each pipe line connected to each piece of equipment, fixture and elsewhere as indicated and specified. Unions shall match the piping system in which they are installed.

1. Unions or flanges shall be provided between all copper to steel connections. These unions shall be dielectric, insulating type.

C. All changes in direction and branches shall be made with manufactured fittings.

D. The use of offset-type reducers is strictly prohibited in any piping system.

E. In all water piping systems, changes in horizontal pipe line sizes shall be made with eccentric

reducers installed flat on top for proper air venting. Reducing tees, reducing elbows and concentric reducers shall only be allowed in water piping systems for changing pipe sizes in vertical risers and for making connections to equipment and accessories from vertical risers.

F. All pipe joints shall be cut square and all burrs shall be removed.

G. Open ends of pipe lines not currently being handled shall be plugged during installation to keep dirt, water and foreign material out of the system.

H. Sanitary waste and storm drainage piping shall slope down in the direction of flow as shown on the drawings or as prescribed by Code, but not less than 1 percent.

I. All vents through roof (VTR'S) shall be a minimum of 4" and shall offset just below the roof such that their termination points are at least 15 ft. from any outside air intake of any HVAC unit; special attention is called to packaged rooftop units.

J. Trap primers shall be provided at all floor drains and hub drains.

K. All pipe, valves fittings, etc. shall be manufactured in the USA.

1.4 IDENTIFICATION OF PIPING

A. All aboveground plumbing systems piping and valves sized 3/4" and larger which are installed in accessible locations (including piping above removable ceilings and behind access panels) shall be identified in strict conformance with the "Scheme for the Identification of Piping Systems" (ANSI A13.1 - 2007) and the Chicago Plumbing Code.

B. Each identification marker shall include the following:

1. Proper color-coded background.
2. Proper color of legend in relation to background color.
3. Proper legend letter size.
4. Proper marker length.
5. Direction of flow arrow shall be included on each marker.

C. Locations for pipe markers shall be as follows:

1. Adjacent to each valve and fitting.
2. At each branch and riser take off.
3. At each pipe passage through walls, floors and ceilings.
4. On all straight pipe runs every 25 feet.

D. Identification markers may be stenciled or shall be Setmark Pipe Markers, as manufactured by Seton Name Plate Corporation.

E. All valves shall be identified with the appropriate service designation and valve number brass valve tags. Each valve tag shall be 19 gauge brass with 1/4" black-filled letters over 1/2" black-filled numbers. Tags shall be fastened to valves with brass "S" hooks or brass jack chain. Brass tags and fasteners shall be as manufactured by Seton Name Plate Corporation

F. Provide charts of all valves. Valve charts shall include the following items:

1. Valve identification Number
2. Location
3. Purpose/Material

PART 2 - PRODUCTS

2.1 SANITARY WASTE AND VENT SYSTEMS

A. All underground sanitary waste and vent piping shall be PVC, DWV Solid Wall Schedule 40 with socket-type, solvent welded joints. All PVC piping shall be installed in accordance to ASTM D2321.

B. Cleanouts shall be provided at the locations indicated and, as a minimum, where required by Code. Floor cleanouts shall be a minimum of 4" and shall be complete with a flush plug and removable, scoriated bronze floor plate. Provide carpet buttons in carpeted areas.

C. All above ground sanitary, waste and vent piping shall be hubless cast iron soil pipe. All cast iron soil pipe and fittings shall bear the collective trademark of the Cast Iron Soil Pipe Institute.

D. Joints on hubless cast iron soil pipe shall be made with neoprene couplings and stainless steel clamps. All couplings shall be manufactured to the CISPI 310 standard, ASTM C 1277, ASTM C 150, FM Standard 1680 Class I and certified by NSF International. Coupling shall be as follows:

1 ½" to 3" Two (2) stainless steel bands
4" to 8"Four (4) stainless steel bands
10" to 15" Heavy duty coupling with six (6) stainless steel bands

All offsets on 6" pipe and larger shall have metal restraining straps by Holdrite or approved equal.

2.2 STORM PIPING SYSTEMS

A. Storm piping systems shall be of the same materials specified above in 2.01 for the sanitary, waste and vent systems; note that all aboveground storm piping located within plenums shall be hubless cast iron soil pipe. All cast iron soil pipe and fittings shall bear the collective trademark of the Cast Iron Soil Pipe Institute.

B. Joints on hubless cast iron soil pipe shall be made with neoprene couplings and stainless steel clamps. All couplings shall be manufactured to the CISPI 310 standard, ASTM C 1277, ASTM C 150, FM Standard 1680 Class I and certified by NSF International. Coupling shall be as follows:

1 ½" to 3" Two (2) stainless steel bands
4" to 8"Four (4) stainless steel bands
10" to 15" Heavy duty coupling with six (6) stainless steel bands

All offsets on 8" pipe and larger shall have metal restraining straps by Holdrite of approved equal.

C. Wall cleanouts shall be threaded cleanout tees and plugs with polished stainless steel coverplate with centerset screw.

D. The roof drains shall be selected for the insulated roof decks indicated. The roof drain bodies and receivers shall be of cast iron construction; domes shall be cast iron or aluminum and the

roof drains shall be complete with flashing clamps having integral gravel stops, deck clamps, gaskets and trim. Roof drains shall be J. R. Smith 1010 or 1015 Series or approved equal products as manufactured by Josam, Zurn.

2.3 DOMESTIC WATER SYSTEM

A. Underground domestic water service entrance piping shall be Type K hard drawn copper tubing with wrought copper fittings. All joints shall be brazed.

B. All underground copper branch lines (1/2" and 3/4" only) shall be continuous lengths of soft Type K copper tubing with no joints allowed underground.

C. Aboveground domestic water system piping 3" in size and smaller shall be Type L hard drawn copper tubing with wrought copper fittings and soldered joints.

D. Gate valves 3" or less in size shall be constructed with a bronze body, non-rising stem. Stem to be bronze ASTM B-62 or silicon bronze ASTM B-371 with malleable iron handwheels. Valve shall meet MSS-SP80. Valve shall be manufactured by Milwaukee, Hammond, Nibco or Stockham.

E. Ball valves 2 inch and smaller:

1. Ball valves shall be two piece bronze body, large port with solid, smooth bore chrome plated brass ball, meeting MSS-SP110. Seats shall be reinforced TFE with Teflon packing ring and threaded adjustable packing nut. Valves on insulated lines will be provided with stem extensions to provide clearance for two inches of pipe insulation. Valves to be Apollo 70, Hammond 8501 or Watts B-6000.

F. Non-freeze wall hydrants (NFWH) shall be non-freeze, bronze box type with vacuum breaker, loose key and wall clamp. Finish shall be rough bronze. Wall hydrants shall be Smith 5509QTPB or approved equal by Josam or Zurn.

G. Backflow preventers shall be Watts Series 909 reduced pressure principle backflow preventers complete with strainer and shut-off valves. Air gap drain shall be piped into nearest floor drain or outside of building to a concrete splashblock.

H. Water pressure reducing valves (PRV) shall be the self-contained direct operating type with bronze body, stainless steel seat, stainless steel spring, and sealed spring cage. The strainer shall have bronze body with 20 mesh stainless steel screen. Strainer shall be attached with a bronze nipple. The unit shall be constructed in accordance with ASSE Standard 1003 and shall bear the seal of approval. The capacities shall be based on maximum reduced pressure fall-off, as defined in the ASSE Standard, of 10 pounds. Pressure regulators shall be Watts Regulator Company's Series 223S or approved equal.

I. All water hammer arresters (WHA) shall conform to the Chicago Plumbing Code.

J. The hose bibbs (HB) shall be complete with vacuum breaker and vandal resistant handle.

K. Soldered joints shall be made with tin-antimony/silver solder. Solder containing lead shall not be permitted.

2.4 NATURAL GAS PIPING

A. Natural gas piping shall be Schedule 40 black steel complying with ANSI B36.10. Fittings

shall be steel or malleable iron. Joints shall be threaded or welded.

B. Gas cocks shall meet ANSI B16.33.

2.5 PLUMBING INSULATION

A. All pipe insulation products shall have a permanent composite insulation, jacket and adhesive fire and smoke hazard rating as tested by procedure ASTM-84, NFPA 255 and UL 723 not exceeding Flame Spread 25 or Smoke Developed 50.

B. Blanket-type insulation shall have an average thermal conductivity not to exceed 0.27 BTU-in. per sq. ft. per degrees F. per hour at a mean temperature of 75 degrees F. Insulation shall have a minimum density of 1 lb./cu.ft. and shall be 2" thick.

C. Preformed insulation for all domestic hot and cold water piping shall be minimum 1" thick preformed fiberglass pipe insulation with white all-service jacket. All longitudinal joints shall be lapped, self-sticking type with all butt joints, tears, etc. sealed with a matching white vapor barrier tape. Elbows shall be mitered or may be Zeston covers filled with equivalent fiberglass insulation. The maximum K value of the insulation shall be 0.23 at 70 degrees F.

2.6 PIPE HANGERS AND SUPPORTS

A. Pipe hangers, hanger rods, trapeze type hangers, upper attachments and other supports shall be selected based on pipe size (plus insulation of pipes specified to be insulated) and the weight of the medium being transported or the medium used for testing, whichever is greater. Provide all hangers and rods, turnbuckles, angles, channels, and other structural supports to support the piping systems. Rods for pipe hangers shall be full size of the hanger manufacturer's catalog listed rod size for each type hanger specified. Hangers and supports shall be Michigan, ITT Grinnell or B-Line.

B. All material utilized for the hanging and support of the piping systems shall be manufactured products which are specifically intended for the purpose of hanging piping systems. The use of wire, steel straps, plastic ties, etc. is strictly prohibited.

C. Pipe hangers selected for supporting horizontal insulated piping shall be sized to fit around the outside of the pipe insulation. Insulated piping shall be supported on galvanized shields.

1. Shields shall be as follows:
   a. Pipes 2" and smaller: 18 gauge x 12" long.
   b. Pipes 2 1/2" and larger: 16 gauge x 18" long.
2. Shields shall be 180 degrees around the lower half of the pipe at all pipe hangers, except that on trapeze hangers, pipe racks and floor supported horizontal pipes, shields shall be 360 degrees around the entire pipe.

D. Pipe hangers touching copper piping shall be copper plated or the piping shall be dielectrically isolated from any steel hangers or clamps that are used. Note the requirement for domestic water piping requires the hangers to be installed over the insulation.

E. Steel rods, framing and clamps shall be plated or primed to prevent rust formation.

PART 3 - EXECUTION

3.1 ARRANGEMENT

A. Follow the general piping layout, arrangement, schematics and details. Provide all offsets, vents, drains and connections necessary to accomplish the installation. Fabricate piping accurately to measurements established at the project site to avoid interference with ductwork, other piping, equipment, openings, electrical conduits and light fixtures. Make suitable provision for expansion and contraction with expansion loops and offsets.

B. Water hammer arresters shall be installed at the top of each riser and on each fixture branch in accordance with Plumbing and Drainage Institute Standard WH201.

C. Cleanouts shall be provided at the base of all sanitary and storm risers.

3.2 UNDERGROUND WATER PIPING

A. All underground domestic water piping shall have a minimum cover of 5'-0".

B. Provide concrete thrust blocks at all changes of direction and secure all mechanical joints with restraining rods.

C. All underground copper water lines shall be protected from corrosion with a continuous plastic sheathing or coating and wrapping. This sheathing or coating and wrapping shall be extended 6" to 12" above finished floor.

3.3 MINIMUM HANGER SPACING

A. Pipe hangers or supports shall be provided within 18" of each horizontal fitting, equipment connection, valve, etc. and at not more than 10 ft. spacings along horizontal runs of straight, plain piping.

B. Riser clamps shall be provided at each floor penetration.

3.4 INSULATION INSTALLATION

A. Provide blanket insulation over all horizontal roof drain piping which is within the building and including the vertical risers to the roof drains and the underbody of the roof drains.

1. Blanket insulation shall be wrapped around the piping and underbodies of roof drains. Ends of insulation shall overlap at least 2" and bottom of insulation shall overlap pipe insulation at pipe connection to roof drain at least 3". Adhere insulation to roof drain underbodies with 100% coverage of fire retardant adhesive and tape all joints with 3" wide foil reinforced kraft tape.

B. Provide insulation over all above ground hot and cold water piping,.

1. All joints and tears shall be sealed with matching white vapor barrier tape.

3.5 PIPING INSTALLATION IN WALLS

A. No water piping shall be installed in the exterior walls.

3.6 DISINFECTION

A. All domestic water piping installed under this Division shall be disinfected with chlorine before it is placed into operation. The chlorinating material shall be liquid chlorine conforming to Federal Specification BB-C-120 and shall be introduced to the system by experienced operators only. The chlorine solution applied to the piping sections or system shall contain at least fifty parts per million of available chlorine and shall remain in the sections or system for a period of not less than sixteen (16) hours. During the disinfection period, all valves shall be opened and closed at least four times. After the disinfection period, the chlorinated water shall be flushed from the system with clear water until the residual chlorine content is not greater than two-tenths parts per million (0.2 PPM). Submit certification to the Architect that the system was disinfected

END OF SECTION 224000