SECTION 15420
PLUMBING PIPING

PART 1 GENERAL

1.1 SCOPE

A. Work consists of all plumbing work indicated on drawings and specified herein. Included are requirements for fees/permits for installation and inspection of all plumbing work. Also see "Instructions to Bidders," "General Conditions," "Supplementary General-Conditions," "Special Conditions," and "General Requirements for Mechanical and Electrical Work" which are hereby made part of this section and shall govern in the event there is a conflict with this section.

1.2 SECTION INCLUDES:

A. Pipe and pipe fittings.
B. Valves.
C. Sanitary sewer piping system.
D. Domestic water piping system.
E. Storm water piping system.
F. Natural gas piping system.

1.3 REFERENCES

A. ANSI/ASME B16.3 - Malleable Iron Threaded Fittings Class 150 ns 300.
B. ANSI/ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings
C. ANSI/ASME B16.22 – Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
D. ANSI/ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
E. ANSI/ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
F. ANSI/ASME Sec. 9 - Welding and Brazing Qualifications.
G. ANSI/ASTM B32 - Solder Metal.
H. ANSI/ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fitting, Schedule 40.
I. ANSI/AWS D1.1 - Structural Welding Code.
J. ASME - Boiler and Pressure Vessel Code.
K. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
L. ASTM A74 - Cast iron Soil Pipe and Fitting.
M. ASTM A120 - Pipe, Steel, Black and Hot-Dipped Zinc Coated (Galvanized), Welded and Seamless, for Ordinary Uses.
N. ASTM A234 - Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and elevated Temperatures.
O. ASTM A395 – Ferritic Ductile Iron Pressure Retaining Castings.
P. ASTM A536 Ductile Iron Castings.
Q. ASTM B88 - Seamless Copper Water Tube.
R. ASTM B306 - Copper Drainage Tube (DWV).
S. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
T. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
U. ASTM D2235 - Solvent Cement for Acrylonitrile - Butadiene - Styrene (ABS) Plastic Pipe and Fittings.
V. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
W. ASTM D2513 - Thermoplastic Gas Pressure Pipe, Tubing and Fittings.

X. ASTM D2680 - Acrylonitrile-Butadiene-Styrene (ABS) Composite-Sewer Piping.
Y. ASTM D2683 - Socket-Type Polyethylene Fillings for Outside Diameter-Controlled Polyethylene Pile.
Z. ASTM D2729 - Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
AA. ASTM D2751 - Acrylonitrile-Butadiene-Styrene (ABS) Sewer Piping and Fittings.
BB. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
CC. ASTM D3033 - Type PSP Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
DD. ASTM D3034 -Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
EE. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
FF. AWS A5.8 - Brazing Filler Metal.
GG. AWWA C601 - Standard Methods for the Examination of Water and Waste Water.
HH. AWWA C606 – Grooved and Shouldered Joints.
II. CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
JJ. ASTM D635 - Flame Retardant.
KK. ASTM F 441/F 441M – CPVC Schedule 80 Pipe.
LL. ASTM D 2846/D 2846M, SDR-11 – CPVC Piping & Tubing.

1.4 QUALITY ASSURANCE

A. Valves: Manufacturer's name and pressure rating marked on valve body.
B. Welding Materials and Procedures: Conform to ASME and applicable state labor regulations.
C. Welder’s Certification: In accordance with ANSI/ASME Sec. 9.

1.5 SUBMITTALS

A. Submit product data under provisions of Section 01300.
B. Include data on pipe materials, pipefittings, valves and accessories.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN FIVE FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
B. Copper Tubing: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.
C. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
B. Cast Iron Pipe: CISPI 301, Hubless service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
C. Copper Pipe: ASTM B306, DWV. Fittings: ANSI/ASME B16.3, cast bronze, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 50B.
D. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld. (Not allowed in plenums)

2.3 WATER PIPING on Service Side of water meter inside the Building: Use any of the following piping materials for each size range:

A. NPS 4 to 6: Steel pipe; grey-iron, threaded fittings and threaded joints.
B. NPS 1 (DN 25) and Smaller: CPVC - Schedule 80, pipe solvent fittings and joints.
C. NPS 4 to NPS 6: Steel pipe with grooved ends; steel piping, grooved-end fittings; grooved-end pipe couplings; and grooved joints.
D. NPS 1 ¼ and NPS 1 ½: CPVC – Schedule 80, pipe solvent or threaded fittings and joints.
E. NPS 4 to NPS 6: Hard Copper tube - Type L; copper pressure fittings; and soldered joints.
F. NPS 4 to NPS 6: Hard Copper tube - Type L with grooved ends; copper grooved-end fittings; grooved-end tube couplings; grooved joints.
G. NPS 8: Steel pipe; grey-iron, threaded fittings and threaded joints.
H. NPS 8: Steel pipe with grooved ends: steel piping, grooved-end fittings, grooved-end pipe couplings and grooved joints.
I. NPS 8: Hard Copper Tube – Type L with grooved ends; copper grooved-end fittings, grooved-end tube couplings, and grooved joints.
J. NPS 10 and NPS 12: Steel pipe; grey-iron, threaded fittings and threaded joints.
K. NPS 10 and NPS 12: Steel pipe with grooved ends: steel piping, grooved-end fittings, grooved-end pipe couplings and grooved joints.

2.4 UNDER-BUILDING SLAB, Domestic Water Piping on House Side of Water Meter, NPS 4 and Smaller: Soft Copper Tube – Type L; copper pressure fittings and soldered joints.

2.5 ABOVE GROUND, Domestic Water Piping: Use any of the following piping materials for each size range:

A. NPS 1 and Smaller: Hard copper tube – Type L; copper pressure fittings and soldered joints.
B. NPS 1 ¼ and NPS 1 ½: Hard copper tube – Type L; copper pressure fittings and soldered joints.
C. NPS 2: Hard copper tube – Type L; copper pressure fittings and soldered joints.
D. NPS 2: Hard Copper tube - Type L with grooved ends; copper grooved-end fittings; grooved-end tube couplings; grooved joints.
E. NPS 4 and Smaller: CPVC – Schedule 80 Plenum Rated pipe; Schedule 80 plenum rated threaded fittings and threaded joints.
F. NPS 2 ½ to NPS 3 ½: Hard copper tube – Type L; copper pressure fittings and soldered joints.
G. NPS 2 ½ to NPS 3 ½: Hard Copper tube - Type L with grooved ends; copper grooved-end fittings; grooved-end tube couplings; grooved joints.
H. NPS 4 to NPS 6: Steel pipe; grey-iron, threaded fittings and threaded joints.
I. NPS 4 to NPS 6: Steel pipe with grooved ends: steel piping, grooved-end fittings, grooved-end pipe couplings and grooved joints.
J. NPS 4 to NPS 6: Hard copper tube – Type L; copper pressure fittings and soldered joints.
K. NPS 4 to NPS 6: Hard Copper tube - Type L with grooved ends; copper grooved-end fittings; grooved-end tube couplings; grooved joints.
L. NPS 8: Steel pipe; grey-iron, threaded fittings and threaded joints.
M. NPS 8: Steel pipe with grooved ends: steel piping, grooved-end fittings, grooved-end pipe couplings and grooved joints.
N. NPS 8: Hard Copper tube - Type L with grooved ends; copper grooved-end fittings; grooved-end tube couplings; grooved joints.
O. NPS 10 and NPS 12: Steel pipe; grey-iron, threaded fittings and threaded joints.

P. NPS 10 and NPS 12: Steel pipe with grooved ends: steel piping, grooved-end fittings, grooved-end pipe couplings and grooved joints

2.6 STORM WATER PIPING, BURIED WITHIN FIVE FEET OF BUILDING

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
B. Cast Iron Pipe: CISPI 301, Hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
C. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld.

2.7 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
B. Cast Iron Pipe: CISPI 301, Hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.
C. PVC Pipe: ASTM D2665. Fittings: PVC. Joints: ASTM D2855, solvent weld. (Not allowed in plenums)

2.8 GAS PIPING, BURIED BEYOND FIVE FEET OF BUILDING

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ATM A234 forged steel welding type, with ANSI/AWWA C105 polyethylene jacket or double layer, half-lapped 10-mil polyethylene tape. Joints: ANSI/AWS D1.1, welded.

2.9 NATURAL GAS PIPING, BURIED WITHIN FIVE FEET OF BUILDING

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ATM A234 forged steel welding type, with ANSI/AWWA C105 polyethylene jacket or double layer, half-lapped 10-mil polyethylene tape. Joints: ANSI/AWS D1.1, welded.

2.10 NATURAL GAS PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ANSI/ASME B16.3, malleable iron, or ATM A234, forged steel welding type. Joints: Screwed for pipe two inches and under; ANSI/AWS D1.1, welded, for pipe over two inches.
B. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ANSI/ASME B16.23, cast brass, or ANSI/ASME B16.29, wrought copper. Joints: ANSI/ASTM B32, solder, grade 95TA.

2.11 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 2" and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
B. Pipe Size Over 2": 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16" thick preformed neoprene bonded.
C. Grooved and Shouldered Pipe End Couplings: Ductile iron housing clamps to engage and lock, where required, designed to permit some angular deflection, contraction, and expansion; 'C' shape pressure responsive synthetic rubber sealing gasket conforming to ANSI/NSF-61; steel bolts, nuts and washers; galvanized couplings for galvanized pipe.
   1. IPS Steel Piping:

a. Rigid Type: Coupling housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1, B31.9 and NFPA 13.
b. Flexible Type: Use in locations where vibration attenuation and stress relief are required.
i) May use flexible couplings in lieu of flexible connectors at equipment connectors.
ii) Place couplings in close proximity to the vibration source.
c. Flange Adapters: Flat face, for direct connection to ANSI Class 125 or 150 flanged components.

2. Hard Copper Tube: Housings cast with offsetting, angle-pattern bolts pads.
a. Housings coated with copper colored alkyd enamel.
b. Manufactured to copper tube dimensions, with FlushSeal® type gasket.

D. Dielectric Connections: Union or waterway with galvanized or plated steel threaded end, copper solder end, steel or ductile iron grooved end, and water impervious isolation barrier.

2.12 GATES VALVES

A. Up to 2": Bronze body, inside screw, single wedge or disc, threaded ends. Valves in copper pipe to have solder joint ends.
B. Over 2": Iron body, bronze trim, rising OS&Y, single wedge, flanged ends.

2.13 GLOBE VALVES

A. Up to 2": Bronze body, rising stem and hand wheel, inside screw, renewable composition disc, screwed ends, with back seating capacity.
B. Over 2": Iron body, bronze trim, rising stem and hand wheel, OS&Y, plug-type disc, flanged ends.

2.14 BALL VALVES

A. Up to 2": Bronze body, stainless steel ball, Teflon seats and stuffing box ring, lever handle. Valves in copper pipe to have soldered joint ends or end to be compatible with piping system.
B. Over 2": Cast steel body; chrome plated steel ball, Teflon seat and stuffing box seals, lever handle. Ductile iron body; chrome plated carbon steel ball and stem, Teflon seat, lever handle.

2.15 GAS COCKS

A. Up to 2": Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.
B. Over 2": Cast iron body and plug, non-lubricated, Teflon packing, flanged ends.

2.16 SWING CHECK VALVES

A. Up to 2": Bronze 45° swing disc, solder screwed ends.
B. Over 2": Iron body, bronze trim, 45° swing disc, renewable disc and seat, flanged ends.
C. 2" through 4": Ductile iron, stainless steel trim, swing disc, stainless steel clapper, grooved ends.

2.17 SPRING LOADED CHECK VALVES

A. Iron body, bronze trim, spring loaded, renewable composition disc, screwed, wafer, or flanged ends.
B. Ductile iron body, stainless steel trim, spring-assisted, aluminum bronze or elastomer encapsulated ductile iron disc, grooved ends.

2.18 RELIEF VALVES

A. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

2.19 ACID WASTE PIPING, BURIED

A. High Silicon Iron Pipe: ASTM A861. Fittings: Bell and Spigot Joints: Acid resistant sealant.
B. Polypropylene Pipe: ASTM D2467, D4101. Fittings: Polypropylene ASTM D1785. Joints: Thermofused.
C. CPVC Pipe: ASTM D1784. Fittings: CPVC. Joints: ASTM F493 Solvent weld (acid grade solvent with yellow die)

2.20 ACID WASTE PIPING, ABOVE GRADE

A. High Silicon Iron Pipe: ASTM A861. Fittings: Bell and Spigot Joints: Acid resistant sealant.
B. Fire Resistant Polypropylene Pipe: ASTM D2467, D4101. Fittings: Polypropylene ASTM D1785. Joints: Thermofused.
C. CPVC Pipe: ASTM D1784. Fittings: CPVC. Joints: ASTM F493 Solvent weld (acid grade solvent with yellow die).
D. Borosilicate Glass Pipe. Fittings: Plastic ASTM D2146, or Glass. Fittings: Compression.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs.
B. Remove scale and dirt, on inside and outside, before assembly.
C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
B. Route piping in orderly manner and maintain gradient.
C. Install piping to conserve building space and not interfere with use of space.
D. Group piping whenever practical at common elevations.
E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
F. Provide clearance for installation of insulation and access to valves and fittings.
G. Provide access where valves and fittings are not exposed.
H. Arrange water piping to drain at low points.
I. Establish elevations of buried piping outside the building to ensure not less than ft of cover. Slope piping and arrange to drain at low points.
J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.

L. Where type of pipe, joints, couplings and supports are subject to rusting, coat in accordance with Section 09900 – Painting.
M. Install bell and spigot pipe with bell end upstream.
N. Install valves with stems upright or horizontal, not inverted.
O. Install a hose bibb on one lavatory (minimum) per group restroom.
P. Grooved Joints:
    1. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer, and the grooving tools shall be of the same manufacturer.
    2. Use gaskets molded and produced by the groove-coupling manufacturer.
    3. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove.
    4. Grooved coupling manufacturer's factory trained representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools, application of groove, and installation of grooved piping products.
    5. Factory trained representative shall periodically inspect the product installation.
    6. Contractor shall remove and replace any improperly installed products.
    7. Pipe shall be certified for use with the manufacturer's system.

3.3 APPLICATION

A. Use proved mechanical couplings and fasteners only in accessible locations or as approved by engineer.
B. Install unions or grooved joint couplings downstream of valves at equipment or apparatus connections.
C. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
D. Install globe or ball valves for throttling, bypass, or manual flow control services.
E. Provide spring loaded check valves on discharge of water pumps.

3.4 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Prior to starting work, verify system is complete, flushed and clean.
B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50-to 80 mg/L residual.
D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15% of outlets.
E. Maintain disinfectant in system for 24 hours.
F. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
G. Flush disinfectant from system until residual equal to that of incoming water of 1.0 mg/L.
H. Take samples no sooner than 24 hours after flushing, from 5% of outlets and from water entry, and analyze in accordance with AWWA C601.

END SECTION