

**SECTION 22 10 00
PLUMBING PIPING**

PART 1 GENERAL

1.1 SCOPE

- A. Work consists of all plumbing work indicated on drawings and specified herein.
- B. Included are requirements for fees/permits for installation and inspection of all plumbing work.
- C. 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 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. ASME B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings
- B. ASME B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
- C. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV
- D. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings DWV
- E. ASME B16.3 - Malleable Iron Threaded Fittings Classes 150 and 300
- F. ASME BPVC Section IX - Welding and Brazing Qualifications
- G. ASME - Boiler and Pressure Vessel Code
- H. ASTM B32 – Standard Specification for Solder Metal
- I. ASTM D2466 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fitting, Schedule 40
- J. AWS D1.1/D1.1M - Structural Welding Code
- K. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless
- L. ASTM A74 – Standard Specification for Cast Iron Soil Pipe and Fitting
- M. ASTM A234/A234M – Standard Specifications for Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
- N. ASTM A395/A395M – Standard Specification for Ferritic Ductile Iron Pressure Retaining Castings for Use at Elevated Temperatures
- O. ASTM A536 – Standard Specification for Ductile Iron Castings
- P. ASTM A861 – Standard Specification for High Silicon Iron Pipe and Fittings
- Q. ASTM B88 – Standard Specification for Seamless Copper Water Tube
- R. ASTM B306 – Standard Specification for Copper Drainage Tube (DWV)
- S. ASTM C564 – Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings
- T. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in A Horizontal Position
- U. ASTM D1784 – Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- V. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120

- W. ASTM D2235 – Standard Specification for Solvent Cement for Acrylonitrile Butadiene Styrene (ABS) Plastic Pipe and Fittings
- X. ASTM D2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure Rated Pipe (SDR Series)
- Y. ASTM D2467 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
- Z. ASTM D2513 – Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing and Fittings
- AA. ASTM D2665 – Standard Specification for Poly(Vinyl Chloride) PVC Plastic Drain, Waste, and Vent Pipe and Fittings
- BB. ASTM D2680 – Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly(Vinyl Chloride) (PVC) Composite Sewer Piping
- CC. ASTM D2683 – Standard Specification for Socket Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
- DD. ASTM D2729 – Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- EE. ASTM D2751 – Standard Specification for Acrylonitrile Butadiene Styrene (ABS) Sewer Piping and Fittings
- FF. ASTM D2855 – Standard Practice for The Two-Step (Primer and Solvent) Method of Joining Poly(Vinyl Chloride) (PVC) or Chlorinated Poly(Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets
- GG. ASTM D3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
- HH. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
- II. ASTM D3350 – Standard Specification for Polyethylene Plastic Pipe and Fittings Materials
- JJ. ASTM D4101 – Standard Specification for Polypropylene Injection and Extrusion Materials
- KK. ASTM F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- LL. ASTM F493 – Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
- MM. ASTM F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
- NN. AWS A5.8M/A5.8 – Specification for Filler Metals for Brazing and Braze Welding
- OO. AWWA - Standard Methods for the Examination of Water and Wastewater
- PP. AWWA C105 – Polyethylene Encasement for Ductile-Iron Pipe Systems
- QQ. AWWA C606 – Grooved and Shouldered Joints
- RR. CISPI 301 – Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
- SS. NSF-372 NSF 372 - Drinking Water System Components – Lead Content.

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. Provide Welder Certification in accordance with ASME BPVC Section IX.
- D. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- E. All castings used for couplings housings, fittings, or valve and specialty bodies shall be date stamped for quality assurance and traceability.

1.5 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.

- B. Include data on pipe materials, pipefittings, valves, and accessories.
- C. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable manufacturer's model number.

PART 2 PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5-FEET OF BUILDING

- A. See section 22 05 00 part 2.1 f for additional material requirements.
- B. Cast Iron Pipe, ASTM A74 service weight
 - 1. Fittings, Cast iron
 - 2. Joints, Hub-and-spigot, CISPI HSN 85 compression type with ASTM C564 neoprene gaskets
- C. Copper Tubing, ASTM B306, DWV
 - 1. Fittings, ASME B16.3, cast bronze, or ASME B16.29, wrought copper
 - 2. Joints, ASTM B32, solder, Grade 50B
- D. PVC Pipe, ASTM D2665
 - 1. Fittings, PVC
 - 2. Joints, ASTM D2855, solvent weld

2.2 SANITARY SEWER PIPING, ABOVE GRADE

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

2.3 WATER PIPING, BURIED WITHIN 5-FEET OF BUILDING

- A. Copper Tubing
 - 1. ASTM B88, Type K, hard drawn
 - 2. Fittings
 - a. Soldered, ASME B16.29, wrought copper
 - b. Pressed, ASME B16.18 or ASME B16.22, copper press fitting with EPDM O-ring
 - 3. Joints
 - a. Soldered, ASTM B32, solder Grade 95TA
 - b. Pressed, ASME B16.18 or ASME B16.22, copper press fitting with EPDM O-ring

2.4 WATER PIPING, ABOVE GRADE

- A. Copper Tubing, ASTM B88, Type L, hard drawn
 - 1. Fittings
 - a. Soldered, ASME B16.18 - bronze sand casting, /ASME B16.22 - wrought copper, ASME B16.23 - cast brass, or ASME B16.29 - wrought copper.
 - b. Pressed, ASME B16.18 or ASME B16.22, copper press fitting with EPDM O-ring
 - c. Grooved, ASME B16.18 - bronze sand casting, /ASME B16.22 - wrought copper, manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.) Basis of Design: Victaulic Copper Connection.

2. Joints
 - a. Soldered, Grooved joints or ASTM B32, solder, Grade 95TA
 - b. Pressed, ASME B16.18 or ASME B16.22, copper press fitting with EPDM O-ring
- 2.5 STORM WATER PIPING, BURIED WITHIN 5-FEET OF BUILDING
 - A. Cast Iron Pipe, ASTM A74 service weight
 1. Fittings, Cast iron
 2. Joints, Hub-and spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets
 - B. Cast Iron Pipe, CISPI 301, Hubless, service weight
 1. Fittings, Cast iron
 2. Joints, Neoprene gaskets and stainless steel clamp-and-shield assemblies
 - C. PVC Pipe
 1. ASTM D2665
 2. Fittings, PVC
 3. Joints, ASTM D2855, solvent weld
- 2.6 STORM WATER PIPING, ABOVE GRADE
 - A. Cast Iron Pipe
 1. ASTM A74 service weight
 2. Fittings, Cast iron
 3. Joints, Hub-and spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets
 - B. Cast Iron Pipe
 1. CISPI 301, Hubless, service weight
 2. Fittings, Cast iron
 3. Joints, Neoprene gaskets and stainless steel clamp-and-shield assemblies
 - C. PVC Pipe, ASTM D2665
 1. Fittings, PVC
 2. Joints, ASTM D2855, solvent weld (Not allowed in plenums)
- 2.7 GAS PIPING, BURIED BEYOND 5-FEET OF BUILDING
 - A. Steel Pipe, ASTM A53/A53M, Schedule 40 black
 1. Fittings, ASTM A234/A234M forged steel welding type, with AWWA C105 polyethylene jacket or double layer, half-lapped 10-mil polyethylene tape.
 2. Joints, AWS D1.1/D1.1M, welded
 - B. Plastic Tubing, ASTM D2513 Thermoplastic Gas Pressure Tubing
 1. Fittings, ASTM D3350 Polyethylene
 2. Joints, ASTM D2683; or ASTM D3261, or ASTM F1055
- 2.8 NATURAL GAS PIPING, BURIED WITHIN 5-FEET OF BUILDING
 - A. Steel Pipe, ASTM A53/A53M, Schedule 40 black
 1. Fittings, ASTM A234/A234M forged steel welding type, with AWWA C105 polyethylene jacket or double layer, half-lapped 10-mil polyethylene tape.
 2. Joints, AWS D1.1/D1.1M, welded
- 2.9 NATURAL GAS PIPING, ABOVE GRADE
 - A. Steel Pipe, ASTM A53/A53M, Schedule 40 black
 1. Fittings, ASME B16.3, malleable iron, or ASTM A234/A234M, forged steel welding type.
 2. Joints, Screwed for pipe 2" and under, AWS D1.1/D1.1M, welded, for pipe over 2".
 - B. Copper Tubing, ASTM B88, Type L, hard drawn
 1. Fittings, ASME B16.23, cast brass, or ASME B16.29, wrought copper
 2. Joints, ASTM B32, solder, grade 95TA
- 2.10 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; center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth, pressure responsive synthetic rubber sealing gasket conforming to ANSI/NSF-61 and NSF-372; ASTM A449 compliant steel bolts, nuts and washers; galvanized couplings for galvanized pipe.
 - 1. IPS Steel Piping:
 - a. Rigid Type, use coupling housings cast with offsetting, angle-pattern bolt pads confirming proper assembly upon visual confirmation of bolt pad contact with no torque requirement and to provide system rigidity and support and hanging in accordance with ANSI B31.1, ANSI B31.9, and NFPA 13. Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 107N.
 - b. Flexible Type, use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Installation-Ready Style 177 or Style 77.
 - 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. Basis of Design: Victaulic Style 741.
 - 2. Hard Copper Tube: Housings cast with offsetting angle-pattern bolts pads confirming proper assembly upon visual confirmation of bolt pad contact with no torque requirement.
 - a. Housings coated with copper colored alkyd enamel.
 - b. Manufacture to copper tube dimensions including center-leg gasket with pipe stop to ensure proper groove engagement, alignment, and pipe insertion depth.
 - c. Installation-Ready, for direct stab installation without field disassembly.
 - d. Basis of Design: Victaulic Style 607.
 - D. Dielectric Connections:
 - 1. 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. Waterway fittings shall be a copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service. Fittings shall have threaded ends, grooved ends, or a combination. Basis of Design: Victaulic Style 647.
- 2.11 GATES VALVES
- A. Up to 2" use, bronze body, inside screw, single wedge, or disc, threaded ends, valves in copper pipe to have soldered joint ends.
 - B. Over 2" use, iron body, bronze trim, rising OS&Y, single wedge, flanged ends.
- 2.12 GLOBE VALVES
- A. Up to 2" use bronze body, rising stem and hand wheel, inside screw, renewable composition disc, screwed ends, with back seating capacity.
 - B. Over 2" use iron body, bronze trim, rising stem and hand wheel, OS&Y, plug-type disc, flanged ends.
- 2.13 BALL VALVES
- A. Up to 2"
 - 1. Bronze body, stainless steel ball with Teflon seats and stuffing box ring, lever handle.
 - 2. Valves in copper pipe use soldered joint ends or end compatible with piping system.

B. Over 2"

1. Cast steel body; chrome plated steel ball, Teflon seat and stuffing box seals, lever handle.
2. Ductile iron body; chrome plated carbon steel ball and stem, Teflon seat, lever handle.

2.14 GAS COCKS

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

2.15 SWING CHECK VALVES

- A. Up to 2" use bronze 45° swing disc with solder screwed ends.
- B. Over 2" use iron body, bronze trim, 45° swing disc, renewable disc, and seat, flanged ends.
- C. 2" through 4" use ductile iron, stainless steel trim, swing disc, stainless steel clapper, grooved ends.

2.16 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.

2.17 RELIEF VALVES

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

2.18 ACID WASTE PIPING, BURIED

- A. High Silicon Iron Pipe, ASTM A861
 1. Fittings use bell and spigot joints with acid resistant sealant.
- B. Polypropylene Pipe, ASTM D2467, D4101
 1. Fittings use Polypropylene ASTM D1785
 2. Joints shall be Thermofused
- D. CPVC Pipe, ASTM D1784
 1. Fittings shall be CPVC
 2. Joints shall be ASTM F493 Solvent weld (acid grade solvent with yellow die)

2.19 ACID WASTE PIPING, ABOVE GRADE

- A. High Silicon Iron Pipe, ASTM A861
 1. Fittings use bell and spigot joints with acid resistant sealant.
- B. Fire Resistant Polypropylene Pipe, ASTM D2467, D4101
 1. Fittings use polypropylene ASTM D1785 and joints use Thermofused
- C. CPVC Pipe, ASTM D1784
 1. Fittings, CPVC and Joints ASTM F493 Solvent weld (acid grade solvent with yellow die).
- D. Borosilicate Glass Pipe Fittings, Plastic ASTM D4101, or Glass Fittings: Compression

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends, and remove burrs.
- B. Remove all scale and dirt on inside and outside of pipe and connectors 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 the piping at a common elevation and location whenever practical.
- 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.
 - 1. Slope piping and arrange to drain at low points.
- J. When welding pipe support members to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to weld.
- K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- L. Install bell and spigot pipe with bell end upstream.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Install a hose bibb on one lavatory (minimum) per group restroom.
- O. Paint all LP and natural gas piping yellow and provide identification label.
- P. Fire Sprinkler Piping:
 - 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. Use pipe certified for use with the manufacturer's system.

3.3 APPLICATION

- A. Use an approved 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 POTABLE 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.

The School District of Palm Beach County

Project Name:

SDPBC Project No.:

END SECTION