

- 1) All ductile iron pipe and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined in SSPC-PA-2 Film Thickness Rating.
- 2) The interior lining of all pipe barrels and fittings shall be tested for pinholes with a nondestructive 2,500-volt test. Any defect found shall be repaired prior to shipment.
- 3) Each pipe joint and fitting shall be marked with the date of application of the lining system along with its numerical sequence of application on that date and records maintained by the applicator of his work.

B) Certification

The pipe or fitting manufacturer must supply a certificate attesting to the fact that the applicator met the requirements of this specification, and that the material used was as specified.

203.1.6.5 Handling:

Protecto 401 lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying.

203.2 JOINTS

- 203.2.1 Cast iron and ductile iron pipe and fittings shall be jointed with any of the end types as specified below unless a particular end type is specified. Fittings shall have mechanical joints, unless otherwise specified. Flanged ends shall be used only where specifically noted on the Drawings except that the valve connection end of all tapping sleeves shall be flanged.
- 203.2.2 Mechanical joints and push-on joints shall conform to, and be tested in accordance with, the current edition of ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pipe and Fittings.
- 203.2.3 Flange joints shall conform to the current edition of ANSI/ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- 203.2.4 Where ductile or cast-iron pipe is to be tapped, a split case iron or a flexible stainless-steel tapping sleeve may be used.
- 203.2.5 Split case iron tapping sleeves shall be of 150 psi working pressure. Sleeve body shall be cast iron conforming to AWWA C110. Sleeves shall have mechanical joints conforming to AWWA C111 on the run and a flange branch conforming to ASME B16.1, Class 125. End gaskets shall be natural rubber or neoprene material conforming to AWWA C111.

- 203.2.6 Flexible stainless-steel tapping sleeves shall be rated at 150 psi pressure, with flanges meeting the current edition of ANSI/AWWA C207. Steel Pipe Flanges for Waterworks Service, Sizes 4 In Through 144 In. (100 mm Through 3,600 mm) Assembly shall be NSF or UL rated. Bolts, nuts, and washers shall be stainless steel. Gaskets shall conform to AWWA C111.
- 203.2.7 Openings of the sizes shown on the drawings shall be furnished with steel blind flanges of proper strength to withstand working pressure of the line where no other provision is made for closing the openings. Blind flanges shall be fabricated from material as specified under AWWA C207. All bolts shall meet the current edition of ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rods 60 000 PSI Tensile Strength, Grade A only, in accordance with AWWA C207.
- 203.2.8 Where restrained joints are specified or required, they shall be of a mechanical type or push-on type assembly easily removed in field once assembled without special equipment. Assemblies shall be ANSI/AWWA rated. Thrust blocks for joint restraint shall not be installed without prior approval by the Director of Water and Sewer. Set screw type retainer glands will not be permitted.

203.3 COATING, LINING, AND POLYETHYLENE WRAP

- 203.3.1 Cast iron and ductile iron pipe and fittings shall be bituminous coated outside and cement-mortar lined inside with seal coat in accordance with American National Standard for Cement Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water, ANSI/AWWA C104/A21.4.
- 203.3.2 All ductile iron and cast-iron pipe and fittings shall be encased with polyethylene tube in accordance with AWWA C105, American National Standard for Polyethylene Encasement for Ductile Iron Piping for water and other liquids referred hereafter as polywrap. Polywrap shall be manufactured from virgin polyethylene material conforming to the following:

203.3.2.1 Raw material requirements, per ASTM D4976:

- A) Group: 2 (Linear).
- B) Density: 0.910 to 0.935 g/cm³.
- C) Dielectric strength: Volume resistivity, 10¹⁵ ohm-cm, minimum.

203.3.2.2 Physical properties of finished film:

- A) Tensile strength: 3,600 psi (24.8 MPa) for an 8 mil (200-μm) minimum thickness, or 28.8 lbf/in. width (50.4 N/cm width), minimum in machine and transverse direction (ASTM D882).
- B) Elongation: 700%, minimum in machine and transverse direction (ASTM D882).

C) Dielectric strength: 800 V/mil (31.8 V/μm) thickness, minimum (ASTM D149).

D) Impact resistance: 600 g, minimum (ASTM D1709 Method B).

E) Propagation tear resistance: 2,550 gf (grams force), minimum in machine and transverse direction (ASTM D1922).

203.3.2.3 Thickness: Linear low-density polyethylene film shall have a minimum thickness of 0.008" (8 mil or 200 μm).

203.3.2.4 Color: Polywrap may be supplied in its natural color, white, black, or weather-resistant black containing not less than 2% carbon black with a particle diameter of 90 nm or less. A minimum 2% of a hindered amine ultraviolet inhibitor is required for all films other than the weather-resistant black film with carbon black. Where other colors are specified for purposes of identification, the pigmentation shall not contain any regulated substances.

203.3.2.5 Tape: The polywrap shall be secured as specified below with 2" wide pressure sensitive tape not less than 10 mils thick. This flexible tape shall consist of a polyethylene or polyvinyl chloride backing with a synthetic elastomeric adhesive film comprised of butyl rubber. Tape shall remain flexible over a wide range of temperatures, with tensile strength and elongation properties in conformance with ASTM D1000.

The minimum tube size for each pipe diameter shall be per Table 1.

Table 1 Polyethylene tube and sheet sizes for push-on joint pipe*

NOMINAL PIPE SIZES	PUSH-ON JOINT FLAT TUBE WIDTH	MECHANICAL JOINT FLAT TUBE WIDTH
3 in.	16 in.	16 in.
4 in.	16 in.	16 in.
6 in.	16 in.	20 in.
8 in.	20 in.	24 in.
10 in.	24 in.	27 in.
12 in.	27 in.	30 in.
14 in.	30 in.	34 in.
16 in.	34 in.	37 in.
18 in.	37 in.	41 in.
20 in.	54 in.	54 in.
24 in.	54 in.	54 in.
30 in.	67 in.	67 in.
36 in.	84 in.	84 in.
42 in.	84 in.	84 in.
48 in.	96 in.	96 in.
54 in.	108 in.	108 in.
60 in.	108 in.	108 in.

64 in.	121 in.	121 in.
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*These wrap sizes should work with most push-on joint pipe and fitting bell sizes. Where bell or fitting circumferences are larger than the tube sizes shown, a larger tube to effectively cover these joints should be ordered.

203.4 GATE VALVES

- 203.4.1 Where gate valves are specified, they shall be resilient-wedged.
- 203.4.2 Resilient-wedged gate valves shall conform to and be tested in accordance with ANSI/AWWA C509. The valve shall be bubble tight from either direction at the rated design pressure of 200 psi. The valve shall have a single disc gate with synthetic rubber seat bonded or mechanically attached to the disc; non-rising stem with 2" AWWA operating nut; counterclockwise opening, "O" ring stem seals, and corrosion resistant interior coating acceptable for potable water use.
- 203.4.3 Where specified, flanges shall be ANSI B16.1, Class 125, cast iron. Mechanical Joint, push-on, and bell and spigot joints are allowed.

203.5 BALL VALVES

- 203.5.1 Ball valves shall conform to and be tested in accordance with the AWWA Standard for Ball Valves, ANSI/AWWA C507. Where ball valves are specified or required, they shall be double-seated with natural or synthetic rubber located in the valve body. Ball seating surfaces shall be stainless steel; designed for 150 psi working pressure; flanged end; "O" ring rotor bearing seals; constructed of high-tensile strength cast iron; counter-clockwise opening; equipped with totally enclosed manual operators, and torque limiting control device. Valves shall be tested by, and shall withstand without leak, a hydrostatic pressure of: one 250 psi on the valve body with rotor in the open position; and two 150 psi on the side of the valve with the opposite side open to atmosphere. Six copies of the test results and manufacturer's drawings shall be submitted for approval prior to delivery of the valve.
- 203.5.2 Valves shall be bubble tight at rated pressure with flow in either direction.
- 203.5.3 Where flanges are specified, they shall be ANSI B16.1, Class 125, cast iron flanges.

203.6 BUTTERFLY VALVES

- 203.6.1 Butterfly valves shall be of the tight-closing, rubber-seat type, shall have a rated pressure of 150 psig, and shall be bubble-tight at this pressure with flow in either direction. Valve opening shall be counterclockwise. The valves shall conform to and be tested in accordance with the AWWA Standard for Rubber-Seated Butterfly Valves, ANSI/AWWA C504, Class 150B. The valve body shall be of the short-body flange type, constructed of cast iron conforming to either ASTM A126, Class B, or ANSI/ASTM A48, Class 40 or ductile iron ANSI/ASTM A536, Grade 65-45-12. Flanges shall be ANSI B 16.1, Class 125, cast iron flanges. Valve Discs shall be constructed of alloy cast iron conforming to ANSI/ASTM A436, Type 1, or cast-iron conforming to ANSI/ASTM A48,