

## 809 METAL PIPE AND FITTINGS

### 809.01 DUCTILE IRON PIPE AND FITTINGS

#### (A) DUCTILE IRON PIPE.

- (1) Pipe shall be ductile-iron meeting the requirements of AWWA C151 with mechanical or push-on joints. Pipe shall be asphaltic coated outside and cement lined with double thickness and seal coated in accordance with AWWA C 104. Pipe shall be furnished in lengths of 18 to 20 feet and shall include all joining materials.
- (2) Unless otherwise specified, outside diameter of ductile-iron plain end shall be the same as for mechanical-joint cast or ductile-iron pipe.
- (3) Wall thickness class shall be per [Table 809-1](#) unless otherwise specified on Contract Drawings.
- (4) Fittings or pipe not properly identified for pressure class, thickness or weight as required by ANSI/AWWA Standard C 110, C 151, or C 153 shall not be used.

**TABLE 809-1  
DUCTILE-IRON PIPE WALL THICKNESS AND PRESSURE CLASSES**

Diameter (Inches)	Pressure (psi)	Pressure Class <sup>1</sup>	Special Thickness Class <sup>2</sup>	Thickness (Inches)
6	350	--	52	0.31
8	350	--	52	0.33
12	350	--	52	0.37
16	350	--	51	0.37
20	350	350	--	0.38
24	300	300	--	0.40
30	200	200	--	0.38
36	200	200	--	0.42
42	200	200	--	0.47
48	200	200	--	0.52
54	200	200	--	0.58
60	200	200	--	0.61

<sup>1</sup>Pressure classes are defined as the rated water working pressure of the ductile-iron pipe in psi.

Rated water working pressure for ductile-iron pipe calculations are based on a 2.0 safety factor times the sum of the working pressure indicated for each nominal size plus a surge allowance of 100 psi as per AWWA C 150.

<sup>2</sup>Special thickness classes were designated as standard thickness classes prior to 1991.

**(B) JOINTS AND FITTINGS – DUCTILE IRON PIPE.**

- (1) Mechanical and push-on joints for ductile iron water main pipe shall be per AWWA C 111.
- (2) Fittings 48 inches and smaller in diameter shall be mechanical bell joint, ductile-iron in accordance with AWWA C 110, including dimensions and weights.
- (3) Fittings 54 inches and larger in diameter shall be push-on ductile-iron proprietary restrained joints in accordance with AWWA C 153.
- (4) Coatings for Fittings :
  - (a) Provide exterior asphaltic coating per AWWA C-110 and interior cement-mortar lining as per AWWA C-104, or
  - (b) Provide interior and exterior fusion bonded epoxy coating, 6-8 mils in thickness, conforming to AWWA C-116.
- (5) All fittings shall be complete with all joint accessories, rubber gaskets, bolts and nuts.

**(C) JOINT RESTRAINT, DUCTILE IRON PIPE.**

- (1) Unless otherwise noted, pressure ratings for pipe harnessing components shall not be less than the pipe working pressures shown in [Table 809-1](#) for each size of pipe.
- (2) Push-on ductile-iron pipe with proprietary restraint shall be as follows:
  - (a) For pipe 36 inches and smaller in diameter; “Flex-Ring Joint Pipe” by American Cast Iron Pipe Company, or “TR-Flex Pipe, by U.S. Pipe and Foundry Company.
  - (b) For pipe 42 inches and larger in diameter: “Lok-Ring Joint Pipe” by American Cast Iron Pipe Company, or “TR-Flex Pipe”, by U.S. Pipe and Foundry Company.
- (3) Retainer glands for restraint of mechanical joint, ductile-iron pipe 24 inches and smaller in diameter shall be designed to fit standard mechanical joint bells conforming to AWWA C 111. Glands shall be manufactured of ductile-iron conforming to ASTM A 536 with restraining mechanism of size and arrangement per manufacturer’s recommendations, of the following type:
  - (a) Ductile-iron wedges in combination with special, heat-treated set screws with or without twist-off nuts, torqued per manufacturer’s recommendations, or
  - (b) Hardened steel set screws with knurled and cupped points, with or without twist off nuts.
  - (c) “Megalug Series 1100” by EBAA Iron Sales, Inc., or “Uni-Flange Series 1400” by Ford Meter Box Co., are considered acceptable.
  - (d) Retainer glands shall meet working pressure ratings for pipe sizes shown in [Table 809-1](#), except 20-inch and 24-inch diameter glands shall meet working pressure of 250 psi.

**(D) SLEEVE TYPE COUPLINGS.**

- (1) Couplings shall be designed, manufactured and installed in accordance with AWWA C219 except as modified below:
  - (a) The manufacturer shall provide an affidavit certifying compliance with the above standard.
  - (b) Couplings shall be designed for the specified operating and test pressures of the lines in which they are used.
  - (c) The manufacturer shall provide test data to verify that the couplings have been hydrostatically tested to the appropriate pressure.
  - (d) The Contractor shall verify the outside diameters of the pipes to be connected, and shall select the correct diameter sleeve-type couplings to ensure a proper fit without utilizing pipe stops.
- (2) The entire sleeve assembly shall be lined and coated with factory-applied coating system as follows:
  - (a) Fusion bonded epoxy per AWWA C 213, 12 mils minimum exterior coating thickness, 15 mils minimum interior coating thickness.
  - (b) Liquid epoxy per AWWA C210, 16 mils minimum, 25 mils maximum coating thickness.
  - (c) Other coating systems as approved by the Chief Engineer.
- (3) Bolts, nuts and harness tie rods shall be stainless or galvanized steel.
- (4) The Contractor may use mechanical joint sleeve at no additional cost to the District.

**(E) BOSSES – DUCTILE IRON PIPE (30-INCH AND LARGER DIAMETER WATER MAIN).**

- (1) A boss connection shall be utilized only where indicated on the Contract Drawings.
- (2) Bosses shall be located within a range of 1-1/2 feet from the bell end to 4 feet from the spigot end of the pipe.
- (3) Bosses shall be ductile-iron, 60-42-10 grade, or mild to medium grade carbon steel castings, as per ASTM A27.
- (4) Pipe sections selected to receive welded-on bossed outlets shall be ferritic grade ductile-iron per the following:
  - (a) Minimum Charpy impact test of 10 ft-lbs per ASTM E23 and AWWA C151.
  - (b) Minimum thickness shall be Special Thickness Class 52.
    1. Bosses shall be shop welded to ductile-iron pipe by the pipe manufacturer's certified welders, using nickel-iron electrodes such as Ni-Rod FC55 Cored Wire produced by Huntington Alloys, Huntington, West Virginia or approved equivalent. Field welding of bossed outlets is prohibited.

2. All completed welds shall have 100 percent of their surface inspected at pipe plant using the "Liquid Dye Penetrant Test Method" to insure integrity of welds.
  - (5) Bosses shall be mechanical joint welded outlets with sockets conforming to AWWA C110, unless otherwise shown on the contract documents. Interior and exterior surfaces of the outlet, including welds, shall be factory coated per [809.01\(B\)](#).
  - (6) Bossed outlets shall be rated at the same pressure as the main pipe but not less than 250 psi with a safety factor of 2.0. Certified results of hydrostatic tests on each bossed outlet shall be submitted to the Chief Engineer prior to delivery.
  - (7) Minor damage to pipe cement lining and coating shall be repaired at pipe plant to meet AWWA C104.
  - (8) Bossed outlets manufactured by U.S. Pipe and Foundry Company or American Cast-Iron Company are conditionally acceptable. The Contractor shall submit statements from the manufacturer stating that these products meet the above requirements.
- (F) **2-INCH BLOWOFF VALVES.** Two-inch gate valve with pentagonal (5-sided) operating key nut shall be iron body, bronze mounted, epoxy coated inside and outside, 100% elastomeric-encapsulated symmetrical wedge, non-rising stem type with threaded ends (no flanges), 250 psi working pressure. Rotation of key nut to open shall be clockwise.

#### **809.02 CORRUGATED METAL CULVERT PIPE AND PIPE UNDERDRAIN**

Corrugated metal culvert pipe shall meet the requirements of AASHTO M 36, for the Type, Class, base metal and gage as specified in the Contract.

Corrugated metal pipe under drain shall meet the requirements of AASHTO M 36, Type III and Class as specified.

#### **809.03 CAST IRON PIPE**

Cast iron pipe and fittings shall meet requirements of ASTM A 74, Extra Heavy type.

#### **809.04 STEEL PIPE**

Steel pipe shall meet the requirements of ASTM A 53 for the Type and Grade specified.

#### **809.05 COPPER TUBE**

Seamless copper water tube shall meet requirements of ASTM B 88, Type K wall.

- (A) **SEAMLESS COPPER PIPE.** Seamless copper pipe shall meet the requirements of ANSI H26.1, ASTM B 42, FS WW-P-377d, or ASME SB-42.
- (B) **THREADLESS COPPER PIPE.** Threadless copper pipe shall meet the requirements of ANSI H26.2 or ASTM B 302.
- (C) **SEAMLESS COPPER TUBE.** Seamless copper tube shall meet the requirements of ANSI H23.3, ASTM B 75, or FS WW-T-797c.

- (D) **COPPER DRAINAGE TUBE, TYPE DWV.** Copper drainage tube, Type DWV shall meet the requirements of ANSI H23.6, ASTM B 306, or CS 229-60.
- (E) **SEAMLESS COPPER WATER TUBE.** Copper water tube, Types K, L, and M shall meet the requirements of ANSI H23.1, ASTM B 88, FS WW-T-799b-1970, or FS WW-T-799b-1963.