

STANDARD SPECIFICATIONS

SECTION 15056

DUCTILE-IRON PIPE AND FITTINGS

PART 1 - GENERAL

A. Description

This section includes materials, installation, and testing of ductile-iron pipe and fittings.

B. Related Work Specified Elsewhere

All related work specified elsewhere, or in other codes or standards, will be as last revised, unless a specific date of issuance is called out in opposition to later revision date(s).

Other sections of the technical specifications, not referenced below, shall also apply to the extent required for proper performance of this work.

- 1. Trenching, Backfilling, and Compacting: 02223
- 2. Concrete: 03300
- 3. Corrosion Protection and Joint Bonding 13110
- 4. Chlorination of Domestic water Mains for Disinfection: 15041
- 5. Hydrostatic Testing of Pressure Pipelines: 15042

C. Approved Manufacturers

1. Fittings

- Tyler
- Trinity Valley
- Dayton
- Sigma

2. Pipe

- Pacific States
- U.S. Pipe
- American Pipe

3. Gaskets

- Johns Manville 109
- Tripac 2000
- John Crane Company Style 777

D. Use of Gray-Iron Fittings

Gray-iron fittings may not be substituted for ductile-iron.

PART 2 - MATERIALS

A. Ductile-Iron Pipe

1. Pressure class or thickness class of DIP shall be determined by the design method detailed in AWWA C150 the "Thickness Design Method."
2. Ductile-iron pipe shall be manufactured in accordance with AWWA C151.
3. All ductile-iron pipe shall be pressure class shown on the plans for bell and spigot pipe, pressure class 350 for plain end pipe and thickness Class 53 for flanged spools unless indicated otherwise.
4. All domestic and recycled water ductile-iron pipe shall be cement-mortar lined in accordance with AWWA C104. Lining thickness shall be the double thickness listed in AWWA C104, Section 4.8.
5. Unless otherwise called out on the plans, a "push-on" type joint shall be used. The joint dimensions and gasket shall be as specified in AWWA C111.

6. Where restrained joints are called for on 8-inches in diameter and smaller pipe, push-on joints shall be restrained with locking gasket rated for 250 psi operating pressure. Joint restraint shall be push-on joint with "Field-Lok" gaskets as manufactured by U.S. Pipe, Perma-Lock Joint as manufactured by Pacific States Cast Iron Pipe Company or approved equal. "TR-Flex" restrained joint pipe as manufactured by U.S. Pipe or approved equal is also an acceptable option for restraint of push-on joints.

Where restrained joints are called for on 10-inches in diameter and larger pipe, use a "TR-Flex" restrained joint pipe as manufactured by U.S. Pipe or approved equal. The restrained joint shall be a boltless restrained push-on joint design and shall contain a positive axial locking restrained system and be capable of deflection after assembly. Restraint of field cut pipe by using U.S. Pipe's "TR Flex Gripper Ring" or approved equal will be permitted as long as the "TR Flex" pipe field weldments are not required. Any restrained joint fitting which will require a pipe field weldment will **not** be permitted under any circumstances. Restraint of field cut pipe shall be kept to a minimum.

7. Flanges for ductile-iron pipe shall be the "screwed-on" type in accordance with AWWA C115.
8. Outlets for DIP shall be as follows:

2" or smaller:	bronze service saddle
2-1/2":	tapped tee or service saddle
4" and larger:	D.I. tee fitting

9. All buried ductile iron pipe for domestic and recycled water use shall have a factory applied bituminous coating of not less than 1 mil. in thickness.
10. All ductile iron pipe and fittings in sewer applications shall be polyurethane or polyethylene lined.

B. Ductile-Iron Fittings

1. Ductile-iron fittings shall be manufactured in accordance with AWWA C110, or AWWA C153. Compact body fittings, as described in AWWA C153, will not be permitted in vault structures.
2. All domestic and recycled water fittings shall be cement-mortar lined in accordance with AWWA C104. Lining thickness shall be the double thickness listed in AWWA C104, Section 4.8.
3. All fittings shall be made with "push-on" joints designed for use with the type of pipe to be joined unless noted otherwise.
4. Restrained push-on joint fittings shall be used only as shown on the plans. For pipe sizes 8-inches in diameter and smaller, push-on joint fittings shall be restrained with locking gasket rated for 250 psi operating pressure. Joint restraint shall be push-on joint with "Field-Lok" gaskets as manufactured by U.S. Pipe, Perma-Lock Joint as manufactured by Pacific States Cast Iron Pipe Company or approved equal. "TR-Flex" restrained joint fitting as manufactured by U.S. Pipe or approved equal is also an acceptable option for restraint of push-on joint fittings in this size.

For pipe sizes 10-inches in diameter and larger, restrained joint fittings shall either be "TR-Flex" restrained joint fitting as manufactured by U.S. Pipe or approved equal, or mechanical joint ductile iron fittings fitted with joint restraints. Mechanical joint restraint shall be incorporated with the design of the follower gland and shall include a restraining mechanism which, when activated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. The joint shall maintain flexibility after burial. Follower glands shall be manufactured of ductile iron conforming to ASTM A536-80. The mechanical joint restraint shall be EBBA IRON, Inc., MEGALUG, UNIFLANGE Series 1400, The Ford Meter Box Co., Inc. or approved equal. Any restrained joint fitting which will require a pipe field weldment will not be permitted.

5. All buried ductile iron fittings shall have a factory applied bituminous coating of not less than 1 mil in thickness.
6. Unless otherwise indicated on the drawings, all fittings with flanged ends shall be ductile iron class 150. The gasket surface shall have a serrated finish of approximately 16 serrations per inch, approximately 1/32-inch deep, with serrations in either a concentric or spiral pattern. All flanges shall be flat faced. In addition, all flanges shall meet the following tolerances:

Bolt circle drilling	±1/16 inch
Bolt hole spacing	±1/32 inch
Eccentricity of bolt circle and	±1/32 inch
Maximum facing with respect to bore	

C. Gaskets

1. Gaskets for flanged joints shall be 1/8-inch thick, cloth-inserted rubber. Full face type gaskets with pre-punched holes shall be used where both flanges are flat face. Ring gaskets extending to the inner edge of the bolts may be used where a raised face flange is present.
2. Rubber gaskets for push-on joints shall be synthetic or natural rubber manufactured in accordance with AWWA C111.

D. Bolts, Nuts, and Washers

1. All bolts and nuts shall be Type 316 stainless steel conforming to ASTM A 193, Grade B8M for bolts, and ASTM A 914, Grade 8M for nuts.
2. Provide one (1) washer for each nut. Washer shall be of the same material as the nuts.
3. The length of each bolt or stud shall be such that between 1/4 inch and 3/8 inch will project through the nut when drawn tight.

E. Polyethylene Lining

1. Lining material for ductile iron pipe and fittings (sewer applications) shall be virgin polyethylene complying with ASTM D1248 and bonded to the interior of the pipe fittings by heat process. The lining material shall be compounded with inert filler and a compound which resists ultraviolet light.
2. The lining shall cover the interior surface of the pipe/fitting from the lain or beveled end to the rear of the gasket socket. The lining thickness shall be not less than 20 mils. The lining may taper at the ends, starting at 4 inches from the edge of the pipe. The minimum thickness at the end of the taper shall be 10 mils.
3. Each pipe shall be guaranteed against separation of the lining from the pipe. Random checks for operation will be made during construction and any indication of separation shall be cause for rejection. The test method shall be mutually agreed upon by the contractor and the District.

F. Polyurethane Lining System

1. The lining material shall be manufactured by Madison Chemical Industries, Inc. The material shall consist of a liquid-applied polyurethane coating especially formulated for use as a protective lining of pipelines carrying sewage. The material shall be Corropipe II Wasteliner. The dry film thickness (DFT) of the lining shall be 40 mils (0.040 inch) nominal.
2. In order to minimize potential dimensional and assembly problems, the coating thickness on sealing areas in the bell socket interior and on the spigot end of the pipe exterior shall be 8 mils (0.008 inch) nominal with a maximum of 10 mils (0.010 inch). Thicker coatings in these areas are acceptable if it is demonstrated that joint dimensions are within allowable tolerances after coatings.

3. The lining material shall be applied to the pipe and fittings by the certified applicator only (Contact Don McCage at Techno Coating at phone number (714) 635-1130 located at 1391 Allec, Anaheim, CA 92680 fax number: (714) 635-6357. The coating shall be holiday tested with a high voltage tester at 50 volts/mil of material thickness. The material shall be applied and repaired to the pipes and fittings in strict accordance with the manufacturer's requirements with no exceptions. District shall be notified five (5) days in advance of the coating installation for factory inspection during the application of the material.
4. All field cut ends shall be repaired and sealed prior to installation per the manufacturer's recommendations.

G. Lubricants

Lubricant for pipe insertion shall be food grade, and biodegradable.

PART 3 - EXECUTION

A. General

Ductile-iron pipe and ductile iron fittings shall be installed in accordance with the applicable Sections of AWWA C600 and as specified herein.

B. Trenching, Backfilling, and Compacting

1. Trenching, backfilling, and compacting shall be in accordance with Section 02223 and as specified herein.
2. Backfill within the pipe zone, including the pipe base, shall be imported sand placed and compacted in accordance with Section 02223.
3. Backfill within the trench zone shall be native earth backfill placed and compacted in accordance with Section 02223.

C. Placement of Pipe in Trench

1. Lay pipes uphill if the grade exceeds 10%.
2. The radius of curvature of the trench shall determine the maximum length of pipe section that can be used without exceeding the allowable deflection at a joint. Combined deflections at rubber gasket, restrained joint, deflection coupling or flexible coupling joints shall not exceed 2 degrees or that recommended by the manufacturer, if smaller.

The manufacturer's printed installation guide outlining the radius of curvature that can be negotiated with pipe sections of various length and the deflection couplings shall be followed if applicable.

3. The pipe shall be laid true to the line and grade shown on the plans within acceptable tolerances. The tolerance on grade is 1 inch. The tolerance on line is 2 inches.

4. Plastic Film Wrap

All ductile-iron pipe and fittings buried underground shall be protected with plastic film wrap in accordance with AWWA C105, unless noted otherwise below. Wrap shall be a loose 8-mil-thick polyethylene tube. All joints between plastic tubes shall be wrapped with 2-inch-wide polyethylene adhesive tape, Polyken 900, Scotch wrap 50, or approved equal.

5. Fittings shall be supported independently of the pipe.

6. Until thrust blocks and supports are poured, fittings shall be temporarily supported by placing wooden skids under the bells so that the pipe is not subjected to the weight of the fitting.

7. All exposed flanges and other metal surfaces and all damaged coatings shall be coated after assembly with a mastic, Minnesota Mining and Manufacturing EC 244, Koppers Bitumastic (Super-Tank) 505, or an approved equal. Stainless steel bolts shall not be coated.

D. Anchors and Thrust Blocks

Concrete anchors and thrust blocks shall be poured against wetted undisturbed soil in accordance with Section 03300 and MNWD standard drawings W-8, W-10 and W-12.

E. Flanged Connections

1. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe run.

2. Clean flanges by wire brushing before installing gasket.

3. Clean flange bolts and nuts by wire brushing, lubricate threads with anti-seize compound, and tighten nuts uniformly and progressively. Between 1/4 inch and 3/8 inch shall project through the nut when drawn tight.

4. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

F. Pipe Support

All exposed pipe shall be supported as detailed in the plans.

G. Disinfection

All domestic water piping shall be disinfected by chlorination in accordance with Section 15041.

H. Testing

All domestic water and recycled water piping shall be hydrostatically pressure tested in accordance with Section 15042.

I. Bonding

Bonding of joints to provide continuity for cathodic protection shall be as specifically shown on the project plans, or directed by the District representative. Bonding of joints shall be per Section 13110.

END OF SECTION