

ITEM 11

DUCTILE IRON PIPE AND FITTINGS

1.0 DESCRIPTION. The Contractor shall, under Item 11, furnish all the materials for and shall fabricate and properly connect in place, at the locations shown on the contract drawings, or as directed, all the polyamine ceramic epoxy lined bell and spigot ductile iron pipe, which is necessary for the proper completion of the work included under this contract, excepting cast iron pipe and fittings specifically included under other items. All ductile iron pipe and fittings supplied under this specification shall include inside polyamine ceramic epoxy lining. Additionally at the point of manufacture, outside asphaltic coating is required for exposed ductile iron.

2.0 SUBMITTALS. Product data for each type of material indicated herein shall be submitted.

A. Reference Standards. Latest revisions:

1. ASTM A193.
2. ASTM A536.
3. ASTM D4976.
4. ASTM E96, G95,
B117, G14, D714,
D1308, G22, F1476-95a
(epoxy lining).
5. AWWA C115, C110,
C153 (exterior).
6. AWWA C104.
7. AWWA C105.
8. AWWA C111.
9. AWWA C150.
10. AWWA C151.
11. AWWA C153.
12. NSF/ANSI 61.

B. Shop Drawings. Shop drawings shall include but not be limited to all materials as listed below:

1. The Contractor shall provide one (1) electronic copy of all materials listed below for shop drawing approval.
2. Shop drawings shall be complete in details and indicate all ductile pipe, fittings and accessories necessary utilizing the listed materials as specified herein.
3. Manufacturer's catalog or general web-site information will not be sufficient to fulfill shop-drawing requirements.
4. All shop drawings submitted for review and approval shall be returned within 10 working days either approved or marked up for further design.

5. After examination of such drawings by the Engineer and the return thereof, the Contractor shall make such correction to the drawings as have been indicated and shall furnish the Engineer with electronic corrections.
6. If requested by the Engineer, the Contractor must furnish additional hard copies.

C. Calculations. This section is not applicable.

D. Certifications.

1. The Contractor shall furnish the manufacturer's sworn certificate of inspection and testing of all ductile iron pipe and interior lining specified herein used on the work. All ductile iron pipe will be subject to inspection and approval by the County after delivery of material to job site.

3.0 MATERIALS. Only materials approved by the SCMSD may be used for the project.

A. Ductile Iron Pipe.

1. Ductile iron pipe shall be of the bell and spigot type using the type of joint that employs a single elongated grooved gasket to affect the joint seal in accordance with AWWA C111. The ductile iron pipe shall be of the size and class as specified on the contract drawings and shall be manufactured in accordance with manufacturing standards ANSI A21.51, ANSI A21.4, AWWA C151, and ASTM A746.

B. Fittings.

1. Fittings for ductile iron pipe shall be compact (standard size) polyamine ceramic epoxy lined fittings of the bell and spigot type using the type joint which employs a single elongated grooved gasket to effect the joint seal. Fittings for ductile iron pipe shall be compact ductile iron fittings, unless otherwise specified on the contract drawings; and conform to above standards. Bolts and nuts shall be stainless steel, AISI Type 304 and meet the requirements of ANSI B18.2.1. For direct bury installations, bolts and nuts shall be corten (COR TEN) weathering steel. All bolts shall include a 6 oz. zinc anode cap on every bolt thread.

C. Polyamine Ceramic Epoxy Lining.

1. All ductile iron pipe shall be lined with a polyamine ceramic epoxy coating in compliance with above reference standards. The lining shall comply with the following specification:
 - a. All ductile pipe and fittings shall be delivered to the application facility without any lining on the interior surface. In addition, no coating shall have been applied to the first six inches of the exterior of the spigot ends.
2. The lining material shall be an amine cured novolac epoxy containing at least 20% by volume of ceramic quartz pigment. Any request for substitution must be accompanied by a successful history of lining pipe and fittings for sewer service, a test report verifying the following properties, and a certification of the test results.

- a. A permeability rating of 0.00 when tested according to Method A of ASTM E-96-66, Procedure A with a test duration of 30 days.
 - b. The following test must be run on coupons from factory lined ductile iron pipe:
 - i. ASTM B-117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two years.
 - ii. ASTM G-95 Cathodic Disbondment 1.5 volts @ 77°F. Results to equal no more than 0.5 mm undercutting after 30 days.
 - iii. Immersion testing rated using ASTM D-714-87.
 - a) —20% Sulfuric acid—No effect after two years.
 - b) —140°F 25% Sodium Hydroxide—No effect after two years.
 - c) —160°F Distilled Water—No effect after two years.
 - d) —120°F Tap Water (scribed panel)—0.0 undercutting after two years with no effect.
 - iv. ASTM G-22 90 Standard practice for determining resistance of Synthetic Polymeric materials to bacteria. The test should determine the resistance to growth of Acidithiobacillus Bacteria and should be conducted at 30 degrees centigrade for a period of 7 days on a minimum of 4 panels. The growth must be limited only to trace amounts of bacteria.
 - c. An abrasion resistance of no more than 3 mils (.075 mm) loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.
3. Application - The lining shall be applied by a certified firm with a successful history of applying linings to the interior of ductile iron pipe and fittings. All applicators must be independently inspected at least two times per year to ensure compliance with the requirements of this specification. This inspection must be coordinated and reviewed by the manufacturer of the lining material and any deviation from the application and/or quality requirements shall be corrected by the applicator. All inspections shall be in writing and a permanent record maintained.
 4. Surface Preparation - Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, etc. Any areas with oil, grease, or any substance that can be removed by solvent, shall be solvent cleaned to remove those substances. After the surface has been made free of grease, oil or other substances, all areas to receive the protective compounds shall be abrasive blasted using sand or grit abrasive media. The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, etc., are removed from the surface. Only slight stains and tightly adhering oxide may be left on the surface. Any area where rust reappears before lining must be re-blasted.
 5. Lining - After surface preparation and within 12 hours of surface preparation, the interior of the pipe shall receive 40 mils nominal dry film thickness. No lining shall take place when the substrate or ambient temperature is below 40°F. The surface also must be dry and dust free. If flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

6. Coating of Bell Sockets and Spigot Ends - Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using a compatible Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.
7. Number of Coats - The number of coats of lining material applied shall be as recommended by the lining manufacturer. However, in no case shall this material be applied above the dry thickness per coat recommended by the lining manufacturer in printed literature. The maximum or minimum time between coats shall be that time recommended by the lining material manufacturer. To prevent delamination between coats, no material shall be used for lining which is not indefinitely re-coatable with itself without roughening of the surface.
8. Touch up and Repair - The Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.
9. Inspection - 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.
 - a. The interior lining of all pipe barrels and fittings shall be tested for pinholes with a non-destructive 2,500-volt test. Any defects found shall be repaired prior to shipment.
 - b. 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.
10. 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.
 - a. 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. The pipe shall not be dropped or unloaded by rolling.
 - b. Care should be taken not to let the pipe strike sharp objects while swinging or being offloaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.
11. Products - The polyamine ceramic epoxy coating shall be Induron Protective Coatings Protecto 401™, Induron Protective Coatings ceramapure PL90 or approved equal.

4.0 EXECUTION.

A. Laying.

1. Installation procedures shall be in accordance with ASTM D2321, ASTM A746 and manufacturer's instructions, except bedding shall be Stark County Type B Bedding.
2. Proper implements, tools and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. All pipe shall be installed as directed by the pipe manufacturer. Under no circumstances shall pipe materials be dropped or dumped into the trench. The pipe and fittings shall be inspected for defects prior to installation.
3. All lumps, blisters and excess coating shall be removed from the bell and spigot end of each pipe, and the outside of the spigot and inside of the bell shall be wire brushed and wiped clean and dry and free from oil and grease before the pipe is laid. Open ends of pipe shall be kept plugged with a Bulkhead during construction.
4. All ductile iron pipe to be laid in trenches shall be placed only after the trench has been excavated a minimum of six (6) inches below the bottom of the pipe are brought back with a cradle of sand thoroughly compacted to grade and shaped to provide a firm trough for receiving the pipe. Sand shall be clean, free-running material, free from stones, lumps, or foreign materials. Bell holes shall be properly located and dug for each joint. No blocking of any kind shall remain under the pipe. Excavation and backfilling of trenches shall be as specified under Item 1.
5. Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Inspector.
6. No pipe shall be laid in water or when, in the opinion of the Engineer, trench conditions are unsuitable.

B. Cutting Pipe.

1. Whenever pipes require cutting to fit into lines, the work shall be done in a satisfactory manner so as to leave a smooth end at right angles to the axis of the pipe. When a piece of pipe is cut to fit into a line, no payment will be made for that portion cut off and not used in the line. All cutting done for pump suction lines shall be done so as to leave a smooth cut surface. The minimum installed pipe length shall be five (5) feet or longer unless otherwise directed by the Engineer.

C. Jointing Push – On Joint Pipe.

1. Before assembly, the inside of the bell, the gasket, and the outside of the pipe from the plain end to the stripe must be wiped clean.
2. Insert gasket into groove in bell. Check correct position by pulling the gasket toward the bell face in all 360 degrees of perimeter.
3. Before starting joint assembly, apply a liberal coating of lubricant (supplied by pipe manufacturer) to the outside of the pipe from the plain end to the painted stripe.
4. With plain end centered in the bell, the plain end is pushed home. When the stripe is no longer visible, the joint is assembled.

D. Drilling – Tapping.

1. Where shown on the Contract Drawings or as required, ductile iron pipe shall be drilled and taped to receive drainage or other piping or plugs. All holes shall be drilled accurately at right angles to the axis of any pipe or fittings.
2. Where the size of pipe to be connected to such as to require bosses for connection, the Contractor shall furnish such pipe with cast bosses suitable for drilling, tapping and connecting such pipe.
3. All tapping shall be carefully and neatly done by skilled workmen with suitable tools.

E. Painting.

1. All field painting work required for cast iron pipe and fittings, shall be performed and paid for under this item.
2. The cost of painting of nuts and bolts as herein specified shall be paid for under this item.

F. Polyethylene Tape Marker.

1. The Contractor shall furnish and install during backfill operation for ductile iron gravity mainline sewer, laterals, and force mains printed polyethylene green (SEWER) tape above the sand backfill, three (3) feet above the crown of the pipe.
2. No separate or extra payment will be made for the furnishing and installation of the marker tape and all costs shall be included for payment under the applicable bid item(s) to which it is related.

G. Anchorage For Force Mains.

1. All cleanouts, air release valves, vacuum valves, plugs caps, tees and bends shall be provided with a reaction backing in addition to being restrained by attaching suitable metal rods, clamps, anchored fittings or harnessed joints, as shown on the plans or as specified so as to prevent movement.
2. Mechanical joint restraint system when used, shall be Megalug, as manufactured by Ebba Iron, Inc., Alpha restrained joint by Romac Industries, Inc., or approved equal.

5.0 ELECTRICAL. This section is not applicable.

6.0 QUALITY ASSURANCE.

A. Testing.

1. All force main pipeline construction shall be subjected to hydrostatic leakage testing as line sections are completed, unless otherwise directed by the Engineer. The hydrostatic leakage testing shall be as specified in Appendix 'D'.

B. Observation.

1. Piping received at the job site shall match lists provided by the Contractor identifying piping and fittings in each shipment received, including serial or mark numberings, weight, class, size and description. No broken, cracked, misshaped, imperfectly coated, unsatisfactory or otherwise damaged ductile iron pipe or fittings shall be used.
2. SCMSD's designated representative will visually observe the work performed. The representative will notify the Engineer of any discrepancies with the contract documents in the course of the Contractor performing the work. The progress observations by the SCMSD do not waive any rights or remedies, nor divest the Contractor of any responsibility for contract compliance or liability for damage.

C. Warranty.

1. Refer to project general conditions for warranty requirements.

7.0 MEASUREMENT. This section is not applicable.

8.0 PAYMENT. The unit pricing for Items 14 and 28 respectively shall include the ductile iron items specified herein when utilized.

END OF SECTION