

SECTION 33 34 13 – DUCTILE IRON FORCE MAIN PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes the Work necessary to completely furnish and install Ductile Iron force main pipe and fittings.
- B. Related sections:
 - 1. Section 31 23 16.16 – Trenching for Water and Sewer Lines
 - 2. Section 31 23 23.19 – Trench Bedding and Backfill for Water and Sewer Lines
 - 3. Section 33 31 23 – Testing Sanitary Sewer Systems
 - 4. Section 33 31 13 – Steel Encasement Pipe
 - 5. Section 33 39 13 – Concrete Manholes
 - 6. Section 33 41 19 – Pipe Laying

1.2 GENERAL

- A. Like items of ductile iron pipe provided hereinafter shall be the end products of one manufacturer to achieve standardization of appearance, operation, maintenance, and manufacturer's services.
- B. General Requirements: See Division 01, GENERAL REQUIREMENTS, which contains information and requirements that apply to the work specified herein and are mandatory for this project.
- C. All pipe shall be circular and shall be of the sizes shown on the Plans and/or listed in the Unit Price Schedule. All pipe shall be new. Used pipe is prohibited.
- D. At the discretion of the Engineer, all pipe line and materials are subject to inspection and approval at the plant of the manufacturer.
- E. All materials shall equal or exceed the standards specified herein.
- F. During the process of unloading, all pipe materials shall be inspected by the Contractor and any damaged pipe set aside.
- G. After pipe lines are laid, the Contractor shall test for defects and leakage as specified in Section 33 31 23, TESTING SANITARY SEWER SYSTEMS of these specifications.
- H. Inspection of pipe at the manufacturer's plant, at the point of delivery, on the job site, or in place shall not relieve the Contractor of his responsibility and the material may be subject to rejection until final acceptance of the completed project.

1.3 SUBMITTALS

- A. General: Administrative, shop drawings, samples, quality control, and contract closeout submittals shall conform to the requirements of Section 01 33 00, SUBMITTAL PROCEDURES.
- B. In addition to the requirements of Section 01 33 00, SUBMITTAL PROCEDURES, submit the following additional specific information:
 - 1. Quality Control Submittals:
 - a. Pipe size, class, and thickness.

- b. Special shipping, storage and protection, and handling instructions.
- c. Test procedures.
- d. Test results, reports, and certifications.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Ductile iron force main pipe shall be provided to conform to materials of construction as specified herein.
- B. All force mains shall be installed with tracer wire as specified in Section 33 41 19, PIPE LAYING.
- C. Weights and Marking:
 - 1. Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals, and cast or stamped on the outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.
- D. Certification:
 - 1. The Contractor shall upon request furnish the Engineer with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable ANSI Specifications for each.

2.2 DUCTILE IRON FORCE MAIN PIPE

- A. All pipe and pipe fittings furnished for underground sewer piping shall have either push-on or mechanical type joints.
- B. Flanged DIP and DI fittings shall be used only as indicated on the Plans. Flanged pipe and pipe fittings shall conform to ANSI/AWWA C115/21.15, Class 250 psi. Flanged drilling shall conform to ANSI B16.1, Class 125 flange.
- C. All DIP, 4-inch through 36-inch, shall conform to the requirements of ANSI/AWWA C150/A21.50 (Thickness Design of Ductile-Iron Pipe) and ANSI/AWWA C151/A21.51 (Ductile Iron, Centrifugally-Cast for Water).
- D. Ductile iron pipe for force mains shall have a minimum Pressure Class of 350.
- E. Standard laying lengths shall be 20 feet \pm 1 inch, unless otherwise specified.

2.3 FITTINGS FOR DUCTILE IRON FORCE MAIN

- A. All fittings over 3-inches shall be ductile iron, mechanical joint fittings and shall conform to the requirements of AWWA C153. All fittings shall have a minimum pressure rating of 350 pounds per square inch. Compact fittings will not be permitted.
- B. All fittings shall be furnished with gaskets. MJ fittings shall also be furnished with bolts, nuts, and iron glands. All plugs, caps, tees, and bends deflecting 22-1/2° or more shall be provided with reaction backing.

- C. All casting and mating surfaces shall be smooth and of a workmanlike quality, free from cracks, holes, scale, shrinkage, distortion, grooves, scratches, and other defects. Fittings and other castings may be rejected if found to be unacceptable by the Engineer in accordance with these Specifications.
- D. Joints shall be mechanical joint, shall conform to AWWA C111, and shall be furnished with Mega-lug type retainer glands and gaskets.
- E. Special fittings shall be in accordance with the pipe manufacturer's recommendations and as approved by the Engineer.
- F. All fittings and appurtenances placed on sanitary sewer lines shall meet with the requirements of the type of pipe used and shall be installed in accordance with the manufacturer's recommendations and as approved by the Engineer.
- G. Connections between different kinds of pipe shall be detailed on the Plans and provide self-cleansing sanitary flow and watertight joints and connections.
- H. All fittings shall be fusion-bonded epoxy coated inside and outside in accordance with ANSI/AWWA C116/A21.16.
- I. All valves and fittings (including in-line valves) shall have Megalug style retainer glands or approved equal. Valves, bends, reducers and other hardware near bends shall be positively bolted, all-threaded, or mechanically joined to each other. Bolted includes single and double flanged adapters (such as Foster Adapters or Swivel Adapters) which provide a solid bolted or mechanical joint type connection.

2.4 DUCTILE IRON PIPE JOINTS

- A. Joints shall be mechanical joints (MJ) or push-on type joints which conform to ANSI/AWWA C111/A21.11 (Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings), unless otherwise specified.
- B. Joints shall have the same pressure rating of the pipe or fittings of which they are a part.
- C. All pipe joints other than those specified herein shall be made in strict accordance with the manufacturer's recommendations and as approved.
- D. All joints shall be made watertight in accordance with the latest applicable AWWA and ASTM standards.

2.5 GASKETS FOR DUCTILE IRON JOINTS AND FITTINGS

- A. Gaskets shall be made of vulcanized styrene butadiene rubber (SBR).
- B. Gaskets shall be marked for nominal pipe size, manufacturer, and year of manufacture.
- C. Gaskets shall comply with the requirements of AWWA C111 (Rubber-Gasket joints for Ductile Iron Pressure Pipe and Fittings).

2.6 DUCTILE IRON JOINT AND FITTING LUBRICANT

- A. Lubricant shall be provided by the pipe manufacturer and applied as per the manufacturer's recommendations in accordance with ANSI/AWWA C111/A21.11 (Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings).
- B. Lubricant shall be non-toxic, not support the growth of bacteria and have no deteriorating effects on the gasket or pipe material.
- C. Lubricant containers shall be appropriately identified and labeled with the manufacturer's name.
- D. Each lubricant container shall have printed instructions for usage and joint assembly.

2.7 COATINGS

- A. Interior Coatings
 - 1. All ductile iron pipe for force mains shall receive the following interior lining treatment:
 - a. Epoxy Lining
 - 1) All DIP and DI fittings shall be lined with a high-build, multi-component amine-cured novalac epoxy lining, containing at least 20% ceramic quartz pigment, by volume.
 - 2) The lining system shall be Protecto 401 Ceramic Epoxy as manufactured by Vulcan Painters, Inc.
 - 3) The lining Applicator shall have a successful history of applying linings to the interior of DIP.
 - b. Condition of Ductile Iron Prior to Surface Preparation
 - 1) All DIP and DI fittings shall have a high-build protective lining on the interior. All DIP and DI fittings shall be delivered to the application facility without any lining on the interior surface. As removal of old linings may not be possible, the intent of this Specification is that the entire interior of DIP and DI fittings shall not have been lined with any substance prior to the application of the lining specified herein.
 - c. Surface Preparation
 - 1) Prior to abrasive blasting, the entire area to receive the protective compound shall be inspected for oil, grease, and other substances. Any areas where oil, grease, or another substance is detected and can be removed by solvent shall be solvent-cleaned using the guidelines outlined in SSPC-SP-1 (Solvent Cleaning).
 - 2) After the surface has been made free of grease, oil, and other substances, all areas to receive the protective compounds shall be abrasive blasted with sand or grit abrasive media.
 - 3) The entire surface to be lined shall be struck with the blast media so that all rust, loose oxides, and other sources of roughness shall be removed from the surface. If rust reappears before coating, the affected areas must be reblasted.
 - d. Lining
 - 1) Within eight (8) hours after surface preparation, the interior of the pipe shall receive approximately 40 mils dry film thickness of the protective lining.
 - 2) Lining shall not occur if the substrate or ambient temperature is below 40° F.
 - 3) The surface shall be dry and dustfree before lining.
 - 4) The linings shall not be used on the face of any flanged pipe or fitting, unless otherwise specified.
 - 5) All fittings shall be lined with approximately 40 mils of the protective lining. The 40 mils system shall not be applied in the gasket grooves.

- e. Coating Gasket and End Spigots
 - 1) Due to the tolerances involved, the gasket area and exterior spigot end, up to six (6) inches back from the end of the spigot end, must be coated with 6 mils nominal, 10 mils maximum Protecto Joint Compound, or approved equal.
 - 2) This coating shall be applied by brush to ensure coverage. Care shall be taken so the coating is smooth, without excess buildup in the gasket groove or on the spigot end.
 - 3) All materials for the gasket groove and spigot end shall be applied after the application of the lining.
 - f. Number of Coats
 - 1) 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 time between coats shall never exceed that time recommended by the lining material manufacturer. No material shall be used for lining which is not indefinitely recoatable without roughening of the surface.
 - g. Touchup and Repair
 - 1) Protecto Joint Compound, or approved equal, shall be used for touchup or repair. Procedures for touchup and repair shall be in accordance with manufacturer's recommendations.
 - h. Inspection and Certification
 - 1) Inspection
 - a) All DIP and DI fitting linings shall be checked for thickness using a magnetic film thickness gage. The thickness testing shall be as set forth in SSPC-PA-2 (Measurement of Dry Coating Thickness with Magnetic Gages).
 - b) The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500 volt test. Any defects shall be repaired prior to shipment.
 - c) Each pipe joint and fitting shall be marked with the date of application of the lining system and the numerical sequence of application on that date.
 - 2) Certification
 - a) The pipe or fitting manufacturer shall supply a certificate attesting that the Applicator met the requirements of these Specifications, the material used was as specified, and the material was applied as required.
- B. Exterior Coatings
- 1. All ductile iron pipe shall have an exterior coating as set forth below.
 - a. Factory Primed Pipe
 - 1) Unless otherwise shown on the Plans, all exposed pipe and fittings within the limits of structure walls or exposed pipe and fittings located aboveground shall be delivered to the job site factory-blasted, cleaned, and primed with one (1) coat of Tnemec Series N140 Pota-Pox Plus, or approved equal compatible paint system.
 - b. Bituminous Coating
 - 1) All pipe and fittings indicated for buried service shall have a petroleum asphaltic coating approximately one (1) mil thick factory-applied to the outside of all pipe and fittings. The finished coating shall be continuous, smooth, neither brittle when exposed to the cold nor sticky when exposed to the sun, and shall be strongly adherent to the pipe or fitting. The bituminous

coating shall not be applied to the first six (6) inches of the exterior of the spigot ends.

PART 3 - EXECUTION

3.1 GENERAL

- A. All pipe and fittings shall be installed in accordance with these specifications and the Plans.

3.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Comply with Section 01 60 00, PRODUCT REQUIREMENTS.
- B. Delivery of Materials: Products shall be delivered in original, unbroken packages, containers, or bundles bearing the name of the manufacturer.
- C. Storage: Products shall be carefully stored in a manner that will prevent damage and in an area that is protected from the elements.

3.3 FIELD QUALITY CONTROL

- A. Contractor shall visually inspect all pipe and fittings upon delivery and set aside and damaged or flawed materials and shall not install any damaged or flawed material.
- B. Contractor shall test for defects and leakage as specified in Section 33 31 23, TESTING SANITARY SEWER SYSTEMS.

3.4 INSTALLATION

- A. Installation shall be as specified in Section 33 41 19, PIPE LAYING.
- B. Pipe trenching shall be as specified in Section 31 23 16.16, TRENCHING FOR WATER AND SEWER LINES.
- C. Pipe bedding and backfill shall be as specified in Section 31 23 23.19, TRENCH BEDDING AND BACKFILL FOR WATER AND SEWER LINES.
- D. Pipe connections to concrete manholes and other concrete structures shall be as specified in Section 33 39 13, CONCRETE MANHOLES.
- E. Pipe installed within steel encasement shall conform to Section 33 31 13, STEEL ENCASEMENT PIPE.

- END OF SECTION -