SECTION 15071 – PIPE: DUCTILE IRON (DIP)

PART 1 – GENERAL

1.1 SCOPE

A. The Contractor shall provide all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of all cast ductile iron piping with all fittings, jointing materials, pipe hangers and supports, anchors, blocking encasement, and other necessary appurtenances as shown on drawings and as specified, in accordance with provisions of the Contract Documents, and completely coordinated with work of all other trades.

B. Although such work is not specifically shown or specified, all supplementary or miscellaneous items, appurtenances, and devices incidental to or necessary for a sound, secure, complete, and compatible installation shall be furnished and installed as part of this work.

C. Pipe shall be installed as specified herein and in Section 02520.

1.2 QUALITY ASSURANCE

A. See Section 01400.

B. Refer to the following standard references with respect to materials, tests, and physical parameters:

1.	ANSI A21.1 (AWWA C101)	Thickness Design of Cast Iron Pipe
2.	ANSI A21.1 (AWWA C104)	Cement-Mortar Lining for Cast Iron and Ductile Iron Pipe and Fittings
3.	ANSI A21.6 (AWWA C106)	Cast Iron Pipe Centrifugally Cast in Metal Molds for Water and Other Liquids
4.	ANSI A 21.8 (AWWA C106)	Cast Iron Pipe Centrifugally Cast In Metal Molds for Water and Other Liquids
5.	ANSI A21.8 (AWWA C08)	Cast Iron Pipe Centrifugally Cast in Sane lined Molds, for Water and Other Liquids
6.	ANSI A21.10 (AWWA C110)	Gray Iron and Ductile Iron Fittings 2-inch through 48 inches
7.	ANSI A21.11 (AWWA C111)	Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe and Fittings
8.	ANSI A21.15 (AWWA C115)	Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges

9.	ANSI A21.50 (AWWA C150)	Thickness Design of Ductile Iron Pipe
10.	ANSI A21.51 (AWWA C151)	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lines Molds, for Water or Other Liquids
11.	MSS SP-6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting End Flanges of Valves and Fittings.

C. Refer to Sections 02221 and 01400.

D. The manufacturer is responsible for the performance of all inspection requirements as specified in ANSI/AWWA Standards. All pipe and fittings to be installed under this Contract may be inspected at the plant for compliance with these Specifications by the Owner, by an independent testing laboratory selected by the Owner, or by other representative of the Owner.

E. Inspection of the pipe and fittings will be made by the Engineer or other representative of the Owner after delivery and after installation. The pipe shall be subject to rejection at any time on account of failure to meet any of the Specification requirements, even though pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed immediately from the work site.

F. The pipe materials specified in this Section shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacturing of the specified materials. The manufacturer shall have successfully manufactured and delivered pipe 60 inches in diameter or larger meeting the general intent of this Specification for a minimum of 15 projects over the past five (5) years.

1.3 SUBMITTALS

A. See Section 01300.

B. Submit for approval by the Engineer, as specified in Section 01300, shop drawings, working drawings, and samples showing pipe and lining materials, fittings, joints, gaskets, coatings, manufacturer name, installation procedures, and a schedule of pipe to be installed, including the lengths of individual pipes by diameter, class, and location for the entire Contract. Partial Submittals will not be accepted.

C. At least 7 days prior to each shipment of pipe, submit the manufacturer's certification and certified test reports that the pipe and linings and coatings were manufactured and tested in accordance with the ASTM and ANSI/AWWA Standards specified herein.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Ductile iron pipe shall be as manufactured by US Pipe, Griffin Pipe, American or equal.

B. Provide all ductile iron pipe fittings in full compliance to following specifications:

Type of Material	Ductile Iron
Pipe (8-inch to 60-inch)	ANSI A21.51 Iron Pressure Class 350
Fittings (12 inches and over) (less than 12 inches)	ANSI A21.10 250 psi rated 350 psi rated

C. For buried piping with specified or designated hydrostatic test pressure of 150 psi or less, use ductile iron fittings. For exposed or submerged piping, fittings shall be same material specifications as connecting piping system unless noted otherwise. Linings and coating requirements of piping shall be same requirement for fittings, compact fittings, joints, and related appurtenances.

D. For ductile iron pipe and fittings used for waterline construction, provide interior cement lining in full compliance to ANSI A21.4 of standard thickness.

E. For ductile iron pipe and fittings used for conveyance of sewerage, provide interior lining of ceramic epoxy to a minimum dry film thickness of 40 mils. Lining material shall be Protecto 401 or approved equal.

F. Furnish and install rubber gaskets for push-on joint and mechanical joint cast iron piping in full compliance to material and installation notes in ANSI A21.11.

G. Provide an outside pipe coating of bituminous material a minimum of one mil thick except for exposed pipe scheduled to be painted. Insure that final coating is continuous and smooth, neither brittle when cold nor sticky when exposed to sunlight, and strongly adherent to pipe at all temperatures. Repair outside abrasion marks with adequate coatings of pitch paint.

H. Furnish ductile iron piping as described on drawings in full compliance to following listing:

Application	Type
Joint Connections for buried	Push on with mechanical (gland type) joint at fittings or restrained where noted
Joint Connections for exposed service	Flanged, mechanical coupling
Outside Coating for buried service	Bituminous paint
Outside Coating for exposed service	Bituminous paint

Lining for exposed for buried	See Section 15071 Paragraphs 2.1D and 2.1E

Coatings and linings shall include both pipe and incorporated fittings.

PART 3 – EXECUTION

3.1 JOINING METHODS

A. Mechanical (Gland-Type) Joints. Assemble mechanical joints carefully in accordance to manufacturer's recommendations. If effective seal is not obtained, disassemble, thoroughly clean, and reassemble the joint. Tighten bolts evenly around the pipe until following range of torques is achieved:

Bolt Size, Inc.	Range of Torque, ft/lb.
5/8	40 – 60
3/4	60 – 90
1	70 – 100
1-1/4	90 – 120

Do not overstress bolts.

Where piping utilizes mechanical joints with tie rods, align joint holds to permit installation of harness bolts.

3.2 PUSH-ON JOINTS

A. Assemble push-on joints in accordance with manufacturer's directions. Bevel and lubricate spigot end of pipe to facilitate assembly without damage to gasket. Insure the gasket groove is thoroughly clean. For cold weather installation, warm gasket prior to placement in bell. Taper of bevel shall be approximately 30° with centerline of pipe and approximately ¼-inch back.

3.3 FLANGED JOINTS

A. Furnish materials and perform flanged joints in accordance with ANSI A21.15 unless otherwise directed by these specifications. Extend pipe completely through screwed-on flange and machine flange face and pipe in single operation. Make flange faces flat and perpendicular to pipe centerline. Insure contact faces meet standard finish requirements stated in MSS SP-6. Furnish flanges drilled and faced per ANSI B16.1 for both 125 lb. and 250 lb. working pressure locations. Furnish gaskets conforming to ANSI B16.21, and ASTM D1330, Grade I. When bolting flange joints, exercise extreme care to insure that there is not restraint on opposite end of pipe or fitting which would prevent uniform gasket compression, cause unnecessary stress, bending, or torsional strains being applied to cast flanges or flanged fittings. Allow one flange free movement in any direction while bolts are being tightened. Use hot-dipped zinc galvanized ASTM A307, Grade B, steel bolts meeting requirements of ANSI B16.1. Do not assemble adjoining bell and spigot joints until flanged joints in piping system.

have been tightened. Gradually tighten flange bolts uniformly to permit even gasket compression.

3.4 RESTRAINED JOINTS

A. Where indicated upon drawings, install restrained joints of following types:

1. Pipe and fittings 12 inches and smaller use joint restraint equal to Super-Lock Joint by Clow Corporation.

2. Pipe and fittings larger than 12 inches, use restraint joints equal to TR Flex by US Pipe Co., or Super-Lock Joint by Clow Corporation.

3. Restrained joint piping shall be ductile cast iron. Design joints for working pressure of 250 psi. Insure that samples of restrained push-on joints have successfully been tested to 500 psi by manufacturer without leakage or joint separation.

3.5 CUTTING PROCEDURES

A. Cut pipe in neat workmanlike manner which will not damage the pipe or interior liner material. Use abrasive wheel cutters or saws to cut ductile iron. Make cuts square to centerline of pipe, and then thoroughly clean and swab off foreign matter before installing in work. Bevel and free cut ends of sharp edges after cutting.

3.6 COUPLINGS

A. Compressive Sleeve Coupling. Furnish and install straight coupling and flexible coupling of cast coupling compression-sleeved type. Incorporate units conforming to following criteria:

1. Use compression sleeve couplings equal to Smith-Blair No. 431 or Dresser Style 38.

2. Provide sleeves constructed of high grade gray cast iron ASTM A48. Insure ends are smooth inside tapered for uniform gasket seating.

3. Provide flanges made of malleable iron ASTM A47 or Ductile Iron ASTM A339, Grade 35018 or 32510.

4. Provide gaskets of special compounded natural or GRS rubber with no reclaimed materials with good resistance ratings for service intended.

5. Install steel double radius head bolts with heavy semi-finished hexagon nuts.

6. Finish cast parts with lacquer finish compatible with (bitumastic, coal, tar, and painted) finish coating.

B. Install coupling to allow space of not less than ¼ inch but not more than one inch.

3.7 JOINT ACCEPTANCE TESTING

NOT USED

3.8 LEAKAGE TESTING

A. After the sewer has been installed and cleaned, and after dewatering has stopped and the groundwater table has returned to the original elevations as determined by piezometer wells, the interior of the sewer shall be inspected for leakage. Any leakage from any pipe or any joint shall be repaired by pressure grouting from the ground surface at no additional cost to the Owner. If pressure grouting is unsuccessful, the Contractor shall dewater and excavate and expose the pipe, and install a reinforced concrete collar around the pipe to seal off the leaks. Correction of leakage shall be made at no cost to the Owner.

B. Leakage testing shall be performed in accordance with Section 02520.

3.9 FINAL CLEANING

A. Prior to final manhole-to-manhole inspection by the Engineer of each segment of the sewer system proposed for interim operation, flush and clean all parts of the system to be inspected. Remove accumulated construction debris, rocks, gravel, sand, silt, and other foreign material from the sewer system. Debris shall be removed from the job site.

END OF SECTION 15071