Section 4

Gravity Sanitary Sewers
Ductile Iron Pipe (DIP) and Fittings

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4.01 General

A. DIP shall be allowed for use as gravity sewer pipe where compatible with the specific conditions of the project. IRCDUS may require the use of material other than ductile iron during construction permit review or by IRCDUS field personnel during construction, if it is determined that DIP is unsuitable for the particular application.

B. All DIP shall be manufactured in accordance with AWWA Standard Specifications C150/A21.50-96 and C151/A21.51-96, or latest revisions, and shall be pressure Class 300 or 350 minimum, as depicted on Table 4.1 on page 4-2. All DIP crossings under roadways and other traffic areas shall be pressure Class 350 minimum.

C. Cutting of DIP shall be by sawing only.

4.02 Pipe

A. DIP shall be bell and spigot cast in accordance with the latest AWWA Standard Specifications C151/A21.50and C151/A21.51. Cast ductile iron shall have a minimum tensile strength of 60,000 psi with a minimum yield strength of 42,000 psi. Pipe wall thicknesses shall be computed in accordance with AWWA Standard Specifications C150/A21.50-96, latest revision, using the physical characteristics cited above with a minimum working pressure of 300 psi and a Laying Condition “Type 2”. Unless otherwise indicated or specified herein, the pipe shall have the minimum wall thickness according to class designation for diameters shown. All pipes shall be given a minimum factory hydrostatic test of 500 psi.

Table 4.1
Pressure Class 300 and 350

Nominal Size Diameter (Inches)	Actual Outside Diameter (Inches)	300 PSI Wall Thickness (Inches)	350 PSI Wall Thickness (Inches)
3	3.96	---	0.25
4	4.80	---	0.25
6	6.90	---	0.25
8	9.05	---	0.25
10	11.10	---	0.26
12	13.20	---	0.28
14	15.30	0.30	0.31
16	17.40	0.32	0.34
18	19.50	0.34	0.36
20	21.60	0.36	0.38
24	25.80	0.40	0.43
30	32.00	0.45	0.49
36	38.30	0.51	0.56
42	44.50	0.52	0.63
48	50.80	0.64	0.70
54	57.56	0.72	0.79
60	61.61	0.76	0.83
64	65.67	0.80	0.87

4.03 Fittings

A. All underground fittings shall be either push-on, restrained, or mechanical joint. Mechanical joints shall conform to AWWA Standard Specifications C110/A21.10or C153/A21.53, latest revisions. All aboveground fittings shall be flanged joint.

B. The pressure rating shall be 350 psi (Class 350 Pipe).

C. All fittings shall be lined with the same materials as specified for the pipe, as per paragraph 4.04.

D. Joint restraints, when required, shall be in accordance with IRCDUS Approved Manufacturers' Products List or an approved equal.

4.04 Lining and Coating

A. Unless otherwise indicated, all DIP shall be factory lined and coated.

B. For 4" and larger, the interior protective coating shall be an amine cured novalac epoxy (Protecto 401 or similar). The epoxy material shall be applied in 1 coat with a minimum dry film thickness of 40.0 mils and shall be per the Approved Manufacturers' Products List.

C. Unless otherwise specified, the exterior of the pipe shall have a bituminous coating to a minimum dry film thickness of 1.0 mil.

D. Lining Inspection:
   1. All DIP and fitting linings shall be checked for thickness using a magnetic film thickness gauge. The thickness testing shall be done using the method outlined SSPC-PA-2 film thickness rating.
   2. The interior lining of all pipe and fittings shall be tested for pinholes with a nondestructive 2,500-volt test.
   3. Each pipe joint and fitting shall be marked with the date of application of the lining system and with its numerical sequence of application on that date.

E. 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, and that the material was applied as required by the specification.

F. Anywhere that the coating is removed purposely or accidentally, the area shall be cleaned of any rust, grease, and dirt and re-coated to a minimum dry film as specified for the individual piece.

G. If and when directed by the Engineer of Record and IRCDUS, a polyethylene encasement shall be provided around pipe, fittings, and valves. The material, installation, and workmanship shall conform to applicable sections of AWWA Standard Specifications C105/A21.5, latest revision. Installation methods A or B shall be employed using flat tube polyethylene. The Contractor shall make provisions to keep the polyethylene from direct exposure to sunlight prior to installation. Backfilling following installation shall be completed without delay to avoid exposure to sunlight.

H. All exposed sewer DIP shall be coated (painted) green per the Approved Manufacturers' Product List.

4.05 Bell and Spigot Connections

A. Unless specifically indicated otherwise, restrained push-on joint underground piping shall be manufactured restrained bell and spigot and above ground piping shall be flanged in accordance with AWWA Standard Specifications C111/A21.11-00, or latest revision. Pipe restraints shall also be in accordance with IRCDUS Standards or as directed by Engineer or IRCDUS.

4.06 Submittals

A. Before starting fabrication of the DIP and fittings, the Contractor shall submit one set of complete detailed working drawings (shop drawings) to the Engineer of Record and IRCDUS for approval. Such drawings shall show the pipe, fittings, valves, expansion joints, hangers, supports, and other appurtenances to be installed. Where special fittings are required, they shall be shown in large detail with all the necessary dimensions. The Engineer of Record shall review the drawings and notify IRCDUS of the drawings approved and not approved. IRCDUS shall also review the drawings and coordinate approvals and disapprovals with the Engineer of Record and Contractor. The drawings submitted shall show flanged jointed sections placed so as to be removable without disturbance to the main pipe sections.

4.07 Marking

A. Number 10 stranded conductor copper trace wire shall be spiral wrapped or affixed to the top of the pipe. See Trace Wire Details Drawing M-14 for specifications regarding installation.

B. Trace Wire is required over or around all pipes.

C. Location tape is required over all pipes. Tape is to be installed 12" below proposed finished grade and additional tape shall be adhered directly on top of the pipe if required by IRCDUS.

4.08 Installation

A. Handling and Protection of Pipe: Unless otherwise noted on the drawings or in other sections of these standards, the pipe shall be handled and installed in strict accordance with the manufacturers' instructions. The Contractor shall use every precaution during construction to protect the pipe against the entry of non-potable water, dirt, wood, small animals, and any other foreign material that would hinder the operation of the pipeline. Where the groundwater elevation is above the bottom of the trench, the Contractor shall provide suitable dewatering. All piping shall be placed in a dry trench, unless IRCDUS approves wet trench installation.

B. Depth of Cover and Pipe Elevation: Unless otherwise shown on the drawings, or otherwise authorized by IRCDUS, all pipe shall have a minimum cover of 36 inches. Contractor shall determine top of pipe elevation and top of ground elevation for every two joints of pipe installed using a level. Pipe must have the minimum cover described above and must be within +/- 0.2 feet of the top of pipe elevation indicated on the drawings. Installed pipe, which does not meet these requirements, shall be reinstalled until it does meet these requirements. Contractor shall record top of pipe and top of ground elevations and the locations of where these elevations were

determined and submit this information to IRCDUS. IRCDUS reserves the right to have Contractor excavate and check top of pipe and top of ground elevations to see if they conform to the aforementioned requirements, at no cost to IRCDUS.

END OF SECTION