

## SECTION 707 - METAL PIPE

## 707.01 Ductile Iron Pipe.

**(A) Cast Iron Pipe and Fittings for Sewer System.** Cast iron pipe (Class 150) and fittings and special castings (Class 250) shall be the bell and spigot or flanged type shown in the contract. They shall conform to AWWA's requirements for Cast Iron Pipe and Special Fittings. |

The Contractor shall cover the exterior and interior of the pipe completely with one (1) coat of coal tar paint. \*|

Flange bolts in contact with sewage or sludge shall be of stainless steel or bronze. |

**(B) Ductile Iron Pipe, Fittings and Special Castings for Water System.**

**(1) General.** Ductile iron pipe shall be bell and spigot (caulked joint), mechanical joint, slip-on joint or flanged joint and of the class according to the contract. The Contractor shall furnish pipe in lengths longer than sixteen (16) feet and shorter than twenty (20) feet. \*|

Fittings and special castings shall conform to AWWA C110. Fittings and special castings shall be caulked, mechanical or flanged joint and of the class equal to the ductile iron pipe furnished. Fittings and special castings shall be bell (without spigot or plain ends). Sleeves shall be without centering or butting ring. \*|

If AWWA C110 does not cover the fittings or special castings shown in the contract, the Contractor shall submit shop drawings or manufacturer's specifications to the Engineer for acceptance before casting. The Contractor shall submit two (2) copies of the accepted drawings to the Engineer. \*|

Ductile iron pipe shall be cast centrifugally in metal or sand-lined molds according to AWWA C151. |

The standard dimensions of the ductile iron pipe shall be according to Table 707-I. \*|

TABLE 707-1 - DUCTILE IRON PIPE DIMENSIONS			
Pipe Size (Inches)	Class	Thickness (Inches)	Outside Diameter (Inches)
3	52	0.28	3.96
4	52	0.29	4.80
6	52	0.31	6.90
8	52	0.33	9.05
10	52	0.35	11.10
12	52	0.37	13.20
16	52	0.40	17.40
18	52	0.41	19.50
20	52	0.42	21.60
24	52	0.44	25.80
30	52	0.47	32.00
36	52	0.53	38.30
42	52	0.59	44.50

(2) **Interior Lining.** Pipes, fittings and special castings, except sleeves and plugs, shall be cement mortar lined according to AWWA C104, except the thickness of the lining shall be as follows:

Pipe Size (Inches)	Lining Thickness (Inch)
3-12	1/16
14-24	3/32
30-48	1/8

Interior linings shall have tapered ends. The Contractor shall seal the interior linings with a bituminous seal coat.

(3) **Exterior Coating.** The Contractor shall coat the pipes, fittings and special castings on the exterior surfaces with a coal-tar base paint that shall:

- (a) dry to a hard, tough, durable film,
- (b) effectively resist abrasion and peeling due to handling, transportation, and installation of the pipe, and
- (c) not crack nor check due to loss or evaporation of its ingredients.

The Contractor shall process the paint with a permanently \*|  
 elastic and non-volatile flux with no tendency to further shrinkage  
 from loss or evaporating of such flux after the paint film has  
 become thoroughly dry and hard. Surfaces shall be clean and dry,  
 free from grease, oil, sand, and other foreign matter when painted.

**(4) Caulked Joint Pipes and Fittings.** Caulked joint shall conform |  
 to Subsections 705.09 - Lead and 705.10 - Packing for Lead Joint. |

Caulked joint fittings shall conform to AWWA C110. |

**(5) Mechanical Joint Pipes and Fittings.** Mechanical joint pipe |  
 and fittings shall have joints conforming to AWWA C110, Rubber |  
 Gasket Joints for Cast Iron Pressure Pipe and Fittings. |

Gaskets shall be vulcanized crude rubber of first-grade  
 plantation rubber.

The Contractor shall make mechanical joint fittings according \*|  
 to AWWA C110. \*

Bolt holes shall straddle the vertical centerline of fittings |  
 and special castings.

**(6) Slip-On Joint Pipes and Fittings.** Slip-on joint or push-on |  
 joint shall conform to AWWA C111. The plain end of the pipe shall |  
 have a slight taper to ease its sliding to fit with the gasket  
 when the Contractor makes the joint. \*

Fittings for slip-on joint pipe shall be either caulked or  
 mechanical joint fittings. |

**(7) Flanged Joint Pipes and Fittings.** Flanged pipes with a laying |  
 length of thirty-six (36) inches or less and fittings and special |  
 castings shall have integral flanges and shall be sand-cast. The \*|  
 Contractor shall furnish flanged pipe with a laying length greater \*|  
 than thirty-six (36) inches with one (1) integral flange and the  
 other flange screwed tight on the pipe until the pipe end projects  
 beyond the flange. Flange pipe shall be machined flush with the \*|  
 flange.

The Contractor shall face and drill the flanges according to \*|  
 ANSI B16.1, Class 125 or Class 150 Pipe or ANSI B16b Class 250 or |  
 Class 250 Pipe.

Gasket shall be: \*

**(a)** "full face" one-sixteenth (1/16) inch thick duck-inserted \*|  
 rubber packing; \*

(b) Garlock No. 19, "half face" one-eighth (1/8) inch thick \*|  
"FLANGE TYPE" gasket; \*|

(c) or accepted equal. \*|

Bolts shall be "Cor-ten", "Mayari" or zinc-coated steel machine |  
bolts with cut threads and American Standard heavy hexagon heads.

Nuts shall be "Cor-ten", "Mayari" or zinc-coated American |  
Standard heavy cold-punched hexagon nuts.

The Contractor shall verify the flanged joints for its total \*|  
flange thickness. The bolts shall not protrude more than one-eighth \*|  
(1/8) inch beyond the nut. If the bolts protrude more than one- \*|  
eighth (1/8) inch, the Contractor shall machine cut and zinc-coat \*|  
the bolt end before installation. \*|

Bolt holes shall straddle the centerline.

Flanged fittings shall be Class 150 or Class 250. Fittings  
shall conform to AWWA C110.

**707.02 Corrugated Metal Pipe and Pipe Arch.** The Contractor shall make |  
corrugated metal pipe and pipe arch either aluminum or zinc coated steel as |  
specified in the contract. The Contractor shall furnish shop-formed elliptical |  
culvert and shop-strutted culvert according to the contract. Corrugated zinc |  
coated steel pipe and pipe arch shall conform AASHTO M36 and this section. |  
Corrugated aluminum pipe and pipe arch shall conform to AASHTO M 196 and this |  
section. |

Metal end sections and special sections such as elbows shall comply with |  
the AASHTO specification for base metal, coating, fabrication, sampling, sheet |  
manufacturers' certified analysis, sheet thickness, workmanship, and repair of |  
coating. |

The Contractor shall reroll the ends of individual Type IR pipes or pipes |  
whose corrugations are essentially rectangular ribs projecting outward from |  
the pipe wall to form two and two-thirds (2-2/3) inch by half (1/2) inch |  
annular corrugation extending at least two (2) corrugations from the pipe end. |

Field joints for each type of corrugated metal pipe shall provide |  
circumferential and longitudinal strength to maintain the pipe alignment, |  
prevent separation of pipe, and prevent infiltration of side fill material. |  
Coupling bands shall be either one or two piece construction and shall conform |  
to the AASHTO specification and accepted by the Engineer according to the |  
joint performance criteria of AASHTO Specification for Highway Bridge, |  
Division II Section 23 and identified as "Standard Joints" and according to |  
the contract. |

Coupling bands for corrugated metal pipe shall be less than two (2) standard thickness smaller than the thickness of the pipe connecting. \*  
 Corrugated pipe shall be larger than 0.075 inch and corrugated steel pipe \*  
 shall be larger than 0.079 inch. \*

The Contractor shall connect pipe with rerolled ends having at least two (2) two and two-thirds (2-2/3) inch by half (1/2) inch corrugations at each end with or without an upturned flange with accepted annular coupling bands for pipe of the same diameter and wall thickness and having two and two-thirds (2-2/3) inch by half (1/2) inch corrugation.

**707.03 Bituminous Coated Corrugated Metal Pipe and Pipe Arch.** These culverts and the coupling bands shall conform to AASHTO M 190 for the specified sectional dimensions, sheet thicknesses, and type of bituminous coating. The Contractor shall coat the coupling bands fully with bituminous material. The Contractor shall furnish the shop-formed elliptical culvert and shop-strutted culvert according to the contract. \*

Special sections, such as elbows and flared end sections, for these culverts shall be of the same sheet thickness as the culvert joining. They shall conform to AASHTO M 190. Coating and invert paving shall be of the type specified. \*

**707.04 (Unassigned)**

**707.05 (Unassigned)**

**707.06 Structural Aluminum Plate for Pipe.** Material for structural aluminum plate pipe shall conform to AASHTO M 219. The Contractor shall not mix steel nuts and bolts, aluminum and steel materials. \*

**707.07 (Unassigned)**

**707.08 Structural Steel Plate for Pipe, Pipe Arch, and Arch.** Structural steel plate pipe, pipe arch and arch shall conform to AASHTO M 167 and below. |

If the Contractor uses circular structural steel plate pipe and the contract specifies elongation, the Contractor may shape the plates elliptically at the factory. If the Contractor uses factory elongated plates, the Contractor shall elongate the plates to provide an increase of five (5) percent in the vertical diameter of the pipe culvert after assembly. The Contractor shall mark each plate for proper assembly. \*

The Contractor shall furnish the plates with bolt holes of the proper size so that the Contractor can fasten the plates together longitudinally and transversely. Except abutment plates for part circular culverts, the Contractor shall punch the plates so that the plates can be interchangeable in the erection process. The Contractor shall stagger the bolt holes for longitudinal seams in rows two (2) inches apart. One (1) row shall have holes punched in the valley and the other in the crest of each corrugation along \*

707.08

both edges of each plate. The bolt holes in the longitudinal seam shall not exceed the diameter of the bolt by more than one-eighth (1/8) of an inch. The Contractor shall punch bolt holes for transverse seams less than twelve (12) inches on centers along both edges of each plate. The Contractor shall punch bolt holes in special abutment plates for part circular culverts, when required, according to the contract. No hole shall be closer than one and three-quarters (1-3/4) times the diameter of the bolt measured from the center of the hole to the edge of the plate. \*|

707.09 (Unassigned)

707.10 Zinc-coated Pipe and Fittings. |

(A) **Steel Pipe.** Steel pipe shall be hot-dipped zinc-coated welded and seamless steel, "standard weight" pipe (Schedule 40) according to ASTM A 53. |

(B) **Miscellaneous Fittings and Appurtenances.** Corporation stops shall be according to Subsection 707.11 - Copper Service Pipe and Appurtenances. |

Curb stops shall be according to Subsection 707.11 - Copper Service Pipe and Appurtenances. |

Bushings and plugs shall be zinc-coated malleable iron.

Caps, couplings, crosses, elbows, tees, reducers and extension sleeves shall be "standard" beaded zinc-coated malleable iron. |

Unions shall be zinc-coated malleable iron. Unions shall have ground joints. |

Nipples shall be "standard" zinc-coated steel. The Contractor shall thread the nipples at both ends. \*|

707.11 Copper Service Pipe and Appurtenances.

(A) **Copper Service Pipe.** Copper service pipe shall be soft temper Type K and shall conform to the ASTM B 88. The Contractor shall furnish the copper service pipe up to and including one (1) inch forty (40) or sixty (60) foot coils. The Contractor shall furnish the copper service pipe one and one-quarter (1-1/4) inch and larger in twenty (20) foot lengths. \*|

(B) **Fittings.** Fittings shall be cast bronze or wrought copper and shall conform with ANSI B16.18. Cast bronze shall conform with ASTM B 62. The Contractor shall make wrought copper fittings of commercially pure copper conforming to ASTM B 251. \*|

Fittings required for the various sizes and combination of service laterals and connections shall be according to the contract. |

(C) **Nipples.** Nipples shall be of the same quality as the copper pipe.

(D) **Corporation Stops.** Corporation stops shall have tapered threads for use with "Mueller" tapping machines with threads on the inside to fit "Mueller" tapping machine screw plugs and with the following dimensions:

Corporation Stops (Inch)	Waterway (Inch)	I.P.T. Outside (Inch)
1/2	1/2	3/4
3/4	3/4	1
1	1	1-1/4
1-1/4	1-1/4	1-1/2
1-1/2	1-1/2	2
2	2	2-1/2

The metal composition of the corporation stop shall be according to \*|  
ASTM B 62.

Corporation stops shall withstand a test pressure of two hundred \*|  
(200) pounds per square inch. Waterways shall be round throughout the  
corporation stops.

(E) **Stopcocks.** Stopcocks shall be according to ASTM B 62. Minimum \*|  
acceptable weight of complete fitting shall be more than ninety-five \*|  
(95) percent of the average weight according to the contract. |

The stopcock shall have a raised boss on the head or a groove cut \*|  
into the head to show the open and closed positions of the stopcock. \*|

The net area of the opening through the stopcock shall be more than \*|  
the areas according to the contract. |

The taper on the plug of the stopcock shall be about one and five- \*|  
eighths (1-5/8) inches per foot. |

The Contractor shall core the cocks carefully to insure evenly \*|  
balanced walls. The Contractor shall machine and ground the keys \*|  
properly \*|

Suitable markings on stopcocks shall show the manufacturer. |

The testing engineering firms shall inspect and test the stopcocks \*|  
and accepted by the Engineer. |

The Contractor shall test the cock to a hydrostatic pressure of two hundred (200) pounds per square inch and shall operate satisfactorily without leakage at that pressure. The Contractor shall make this test before easing the cocks. The Contractor may cover the cock with a film of light oil during the test.

The inspecting agency shall select ten (10) percent at random from each size and each lot offered by the manufacturer for witnessing the hydrostatic test on these samples.

The inspecting agency shall select one (1) or more samples per lot of each size and use for checking dimensions, taper, weight, general appearance, workmanship and checking analysis of metal composition.

The Contractor shall submit two (2) copies of the tests to the Engineer with a statement from the Testing Engineers to insure compliance according to the contract.

**(F) Solder and Flux.** Solder shall be one-eighth (1/8) inch diameter and shall contain not more than 0.2 percent lead.

Flux shall conform to Federal Specifications O-F-506C, Type I, Form A Paste.

The Contractor shall deliver the solder and flux in their original containers.

**(G) Service Clamps.** Metal composition of service clamps shall be bronze conforming to ASTM B 62 or Type 304 stainless steel. The Contractor shall make saddles, straps, nuts and washers of compatible material.

The Contractor shall furnish the service clamps with single or double straps. The Contractor shall use double strap service clamps for taps larger than one and a half (1-1/2) inches off eight (8) inch mains and smaller or one (1) inch off twelve (12) inch mains. For mains larger than twelve (12) inches, the Contractor shall use only double strap service clamps.

In corrosive soil, the Contractor shall use bronze service clamps according to the contract or ordered. Saddles, straps, nuts and washers shall be of bronze. For cast iron pipe, the Contractor shall furnish service clamps made of non-corrosive material that is compatible with cast iron.

Service clamps shall have outlets tapped with tapered threads of the size according to the contract. The Contractor shall furnish clamps with neoprene gaskets. The Contractor shall paint the ductile iron clamps with tar and base paint.



**707.12 Spiral Rib Metal Pipe.**

**(A) Spiral Rib Steel Pipe.** The Contractor shall zinc coat the spiral \*|  
rib steel pipe. The spiral rib steel pipe shall conform to AASHTO M 36 \*|  
and Subsection 707.02 - Corrugated Metal Pipe and Pipe Arch except |  
corrugation and fabrication requirements.

Spiral rib steel pipe shall have a continuous helical rib and a  
continuous helical lock seam with the rib spaced midway between seams.  
The rib shall be either: \*|

- (1) three-quarters (3/4) inch wide by one (1) inch high at eleven \*|  
and one-half (11-1/2) inches on centers, \*|
- (2) three-quarters (3/4) inch wide by three-quarters (3/4) inch \*|  
high at seven and one-half (7-1/2) inches on centers or, \*|
- (3) three-quarters (3/4) inch wide by five-eighths (5/8) inch high \*|  
at twelve (12) inches on centers (SRP-II). \*|

The maximum size diameter for SRP-II pipe shall be forty-two (42)  
inches. The Contractor shall fabricate the continuous helical lock seam  
according to AASHTO M 36 and Subsection 707.02 - Corrugated Metal Pipe |  
and Pipe Arch. |

**(B) Spiral Rib Aluminum Pipe.** Spiral rib aluminum pipe shall conform  
to AASHTO M 196 and Subsection 707.02 - Corrugated Metal Pipe and Pipe |  
Arch except corrugation and fabrication requirements. |

Spiral rib aluminum pipe shall have three (3) continuous helical  
rib and a continuous helical seam. The rib shall be either: \*|

- (1) three-quarters (3/4) inch wide by one (1) inch high at eleven \*|  
and one-half (11-1/2) inches on centers, \*|
- (2) three-quarters (3/4) inch wide by three-quarters (3/4) inch \*|  
high at seven and one-half (7-1/2) inches on centers, or \*|
- (3) three-quarters (3/4) inch wide by five-eighths (5/8) inch high \*|  
at twelve (12) inches on centers (SRP-II). \*|

The maximum size diameter for SRP-II pipe shall be thirty (30)  
inches. The Contractor shall fabricate the continuous helical lock seam  
according to AASHTO M 196 and Subsection 707.02 - Corrugated Metal Pipe |  
and Pipe Arch. |

**707.13 Spiral Rib Coupling Band.** Coupling bands shall conform to Subsection  
707.02 - Corrugated Metal Pipe and Pipe Arch and AASHTO M 196 for aluminum |  
pipe and AASHTO M 36 for steel pipe.