

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 of bell and spigot or flanged type and shall conform to AWWA's requirements for Cast Iron Pipe and Special Fittings.

Exterior and interior of pipe shall be completely covered with one 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 mechanical joint, push-on joint, or flanged joint type and of class specified. Pipe lengths shall be longer than 16 feet and shorter than 20 feet.

Fittings and special castings shall conform to AWWA C111.

Fittings and special castings of either mechanical or flanged joint shall be caulked. Fittings and special castings shall be of class equal to ductile iron pipe specified in contract documents. Fittings and special castings shall be bell (without spigot or plain ends). Sleeves shall be without centering or butting ring.

If AWWA C111 does not cover fittings or special castings, shop drawings or manufacturer's specifications shall be submitted to Engineer for acceptance before casting. Two copies of accepted shop drawings shall be submitted to Engineer.

Ductile iron pipe shall be cast centrifugally in metal or sand-lined molds in accordance with AWWA C151.

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Standard dimensions of ductile iron pipe shall conform to Table 707.01-1 – Ductile Pipe Dimensions.

| TABLE 707.01-1 - DUCTILE PIPE DIMENSIONS | | | |
|--|-------|------------------|---------------------------|
| Pipe Sizes (Inches) | Class | Thickness (Inch) | 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 |

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(2) Interior Lining. Cement mortar lined pipes, fittings, and special castings, except sleeves and plugs, shall conform to AWWA C104. Except thickness of lining shall conform to Table 707.01-2 – Thickness of Lining.

| TABLE 707.01-2 – THICKNESS OF LINING | |
|--------------------------------------|-------------------------|
| Pipe Size (Inches) | Lining Thickness (Inch) |
| 3-12 | 1/16 |
| 14-24 | 3/32 |
| 30-48 | 1/8 |

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49 Interior linings shall have tapered ends and shall be sealed with
50 bituminous seal coat.

51
52 **(3) Exterior Coating.** Pipes, fittings, and special castings shall
53 be coated on exterior surfaces with coal tar base paint that:

54
55 **(a)** Dries to hard, tough, durable film.

56
57 **(b)** Effectively resists abrasion and peeling due to handling,
58 transportation, and installation of pipe.

59
60 **(c)** Does not crack or check due to loss or evaporation of
61 ingredients.

62
63 Paint shall be processed with permanently elastic and
64 non-volatile flux. Paint shall have no tendency for further shrinkage
65 from loss or evaporating of such flux after paint film has become
66 thoroughly dry and hard. Surface to be painted shall be clean and
67 dry, and free from grease, oil, sand, and other foreign matter.

68
69 **(4) Mechanical Joint Pipes and Fittings.** Joints of mechanical
70 joint pipe and fittings shall conform to AWWA C111, Rubber Gasket
71 Joints for Cast Iron Pressure Pipe and Fittings.

72
73 Gaskets shall be vulcanized crude rubber of first-grade
74 plantation rubber.

75
76 Mechanical joint fittings shall conform to AWWA C111.

77
78 Bolt holes shall straddle vertical centerline of fittings and
79 special castings.

80
81 **(5) Push-On Joint Pipes and Fittings.** Push-on joint shall
82 conform to AWWA C111. Plain end of pipe shall have slight taper to
83 ease its sliding to fit gasket when joint is made.

84
85 Fittings for push-on joint pipe shall be either caulked or
86 mechanical joint fittings.

87
88 **(6) Flanged Joint Pipes and Fittings.** Flanged pipes with laying
89 length of 36 inches or less, and fittings and special castings shall
90 have integral flanges and shall be sand-cast. Flanged pipes with
91 laying length greater than 36 inches shall have one integral flange and
92 other flange screwed tight on pipe until pipe end projects beyond
93 flange. Flange pipe shall be machined flush with flange.

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95 Flanges shall be faced and drilled in accordance with Class
96 150 Pipe or ANSI B16b Class 250 or Class 250 Pipe.

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98 Gaskets shall conform to the following:

99
100 (a) "Full face" 1/16-inch thick duck-inserted rubber packing.

101
102 (b) Garlock No. 19, "half face" 1/8-inch thick "FLANGE
103 TYPE" gasket.

104
105 Bolts shall be "Cor-ten", "Mayari" or zinc-coated steel machine
106 bolts with cut threads and American Standard heavy hexagon heads.

107
108 Nuts shall be "Cor-ten", "Mayari" or zinc-coated American
109 Standard heavy cold-punched hexagon nuts.

110
111 Flanged joints shall be verified for their total flange thickness.
112 Bolts shall not protrude more than 1/8 inch beyond nut. Bolts that
113 protrude more than 1/8 inch, shall be machine cut, and bolt end shall
114 be zinc coated before installation.

115
116 Flanged fittings shall be Class 150 or Class 250 and fittings
117 shall conform to AWWA C111.

118
119 **707.02 Corrugated Metal Pipe and Pipe Arch.** Metal pipe and pipe arch shall
120 be made from aluminum or zinc coated steel. Shop-formed elliptical culvert and
121 shop-strutted culvert shall be in accordance with contract documents. Corrugated
122 zinc coated steel pipe and pipe arch shall conform to AASHTO M 36 and this
123 section. Corrugated aluminum pipe and pipe arch shall conform to AASHTO M 196
124 and this section.

125
126 Metal end sections and special sections such as elbows shall conform to
127 AASHTO specification for base metal, coating, fabrication, sampling, sheet
128 manufacturers' certified analysis, sheet thickness, workmanship, and repair of
129 coating.

130
131 Ends of individual Type IR pipes or pipes whose corrugations are essentially
132 rectangular ribs projecting outward from pipe wall to form 2-2/3 inch by 1/2 inch
133 annular corrugation extending at least 2 corrugations from pipe end shall be
134 rerolled.

135
136 Field joints for each type of corrugated metal pipe shall provide
137 circumferential and longitudinal strength to maintain pipe alignment, prevent
138 separation of pipe, and prevent infiltration of side fill material. Coupling bands shall
139 be either one or two piece construction and shall conform to AASHTO specification
140

140 and acceptable by Engineer in accordance with joint performance criteria of
141 AASHTO Specification for Highway Bridge, Division II Section 23 and identified as
142 "Standard Joints".

143

144 Coupling bands for corrugated metal pipe shall be less than two standard
145 thicknesses smaller than connecting pipe thickness. Corrugated pipe shall be larger
146 than 0.075 inch and corrugated steel pipe shall be larger than 0.079 inch.

147

148 Pipe with rerolled ends having at least two 2-2/3 inch by 1/2 inch corrugations
149 at each end with or without upturned flange shall be connected with accepted
150 annular coupling bands for pipe of same diameter and wall thickness and having
151 2-2/3 inch by 1/2 inch corrugation.

152

153 **707.03 Bituminous Coated Corrugated Metal Pipe and Pipe Arch.** Culverts
154 and coupling bands shall conform to AASHTO M 190 for specified sectional
155 dimensions, sheet thicknesses, and type of bituminous coating. Coupling bands
156 shall be fully coated with bituminous material. Culverts shall be shop-formed
157 elliptical culvert and shop-strutted culvert.

158

159 Special sections, such as elbows and flared end sections, shall conform to
160 AASHTO M 190. Special sections shall have same sheet thickness as joining
161 culvert. Invert shall be paved and coated as specified in contract documents.

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163 **707.04 (Unassigned)**

164

165 **707.05 (Unassigned)**

166

167 **707.06 Structural Aluminum Plate for Pipe.** Material for structural aluminum
168 plate pipe and pipe arch shall conform to AASHTO M 219. Steel nuts and bolts,
169 and aluminum and steel materials shall not be mixed.

170

171 **707.07 (Unassigned)**

172

173 **707.08 Structural Steel Plate for Pipe, Pipe Arch, and Arch.** Structural steel
174 plate pipe, pipe arch and arch shall conform to AASHTO M 167 and below.

175

176 If circular structural steel plate pipe is used and elongation is specified, plates
177 may be shaped elliptically at factory. If using factory elongated plates, they shall be
178 elongated to provide increase of 5 percent in vertical diameter of pipe culvert after
179 assembly. Each plate shall be marked for proper assembly.

180

181 Plates with bolt holes of proper size shall be furnished such that they can be
182 fastened together longitudinally and transversely. Except for abutment plates for
183 part circular culverts, plates shall be punched such that they can be interchangeable
184 in erection process. Bolt holes for longitudinal seams shall be staggered in rows 2
185 inches apart. One row shall have holes punched in valley and other in crest of each
186 corrugation along both edges of each plate. Bolt holes in longitudinal seam shall

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187 not exceed diameter of bolt by more than 1/8 inch. Bolt holes for transverse seams
188 shall be punched less than 12 inches on centers along both edges of each plate.
189 Bolt holes in special abutment plates for part circular culverts shall be punched,
190 when required. No hole shall be closer than 1-3/4 times diameter of bolt measured
191 from center of hole to edge of plate.

192

193 707.09 (Unassigned)

194

195 707.10 Zinc-Coated Pipe and Fittings.

196

197 **(A) Steel Pipe.** Steel pipe shall be hot-dipped zinc-coated welded and
198 seamless steel, standard weight pipe (Schedule 40) according to ASTM A
199 53.

200

201 **(B) Miscellaneous Fittings and Appurtenances.** Corporation stops
202 shall conform to Subsection 707.11 - Copper Service Pipe and
203 Appurtenances.

204

205 Curb stops shall conform to Subsection 707.11 - Copper Service Pipe
206 and Appurtenances.

207

208 Bushings and plugs shall be zinc-coated malleable iron.

209

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

212

213 Unions shall be zinc-coated malleable iron with ground joints.

214

215 Nipples shall be standard zinc-coated steel, threaded at both ends.

216

217 707.11 Copper Service Pipe and Appurtenances.

218

219 **(A) Copper Service Pipe.** Copper service pipe shall be soft temper
220 Type K and conform to ASTM B 88. Copper service pipe up to and
221 including 1 inch shall be furnished in 40 or 60-foot coils. Copper service
222 pipe 1-1/4 inches and larger shall be furnished in 20-foot lengths.

223

224 **(B) Fittings.** Fittings of cast bronze or wrought copper shall conform to
225 ANSI B16.18. Cast bronze shall conform to ASTM B 62. Wrought copper
226 fittings of commercially pure copper shall conform to ASTM B 251.

227

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

229

230 **(D) Corporation Stops.** Corporation stops shall have tapered threads for
231 use with Mueller tapping machines with threads on inside to fit Mueller
232 tapping machine screw plugs and with dimensions in Table 707.11-3 –
233 Corporation Stop Dimensions.

234

| TABLE 707.11-3 – CORPORATION STOP 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 |

235

236

Metal composition of corporation stop shall conform to ASTM B 62.

237

238

Corporation stops shall withstand test pressure of 200 pounds per square inch. Waterways shall be round throughout corporation stops.

239

240

241

(E) Stopcocks. Stopcocks shall conform to ASTM B 62. Minimum acceptable weight of complete fitting shall exceed 95 percent of average weight.

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245

Stopcock shall have raised boss on head or groove cut into head to show open and closed positions of stopcock.

246

247

248

Net area of opening through stopcock shall exceed areas specified in contract documents.

249

250

251

Taper on plug of stopcock shall be about 1-5/8 inches per foot.

252

253

Stopcocks shall have suitable markings showing manufacturer.

254

255

Contractor shall submit testing results of stopcocks for inspection and acceptance by Engineer.

256

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258

Stopcocks shall be tested to hydrostatic pressure of 200 pounds per square inch and shall operate satisfactorily without leakage at that pressure. Test shall be made before easing stopcocks. Stopcock may be covered with film of light oil during test.

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263

Contractor shall select 10 percent at random from each size and each lot for hydrostatic testing by Contractor. Contractor shall notify Engineer two working days prior to performing hydrostatic testing.

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267 Contractor shall select one or more samples per lot of each size.
268 Engineer will use samples for checking dimensions, taper, weight, general
269 appearance, workmanship, and checking analysis of metal composition.

270
271 Contractor shall submit two copies of test results to Engineer.

272
273 **(F) Solder and Flux.** Solder shall be 1/8-inch diameter and shall contain
274 not more than 0.2 percent lead.

275
276 Flux shall conform to Federal Specifications O-F-506C, Type I, Form
277 A Paste.

278
279 Solder and flux shall be delivered in their original containers.

280
281 **(G) Service Clamps.** Service clamps with metal composition of bronze
282 shall conform to ASTM B 62 or Type 304 stainless steel. Saddles, straps,
283 nuts, and washers shall be compatible material.

284
285 Service clamps shall have single or double straps. Double strap
286 service clamps shall be used for taps larger than 1-1/2 inches off 8-inch
287 mains and smaller, or 1 inch off 12-inch mains. For mains larger than 12
288 inches, only double strap service clamps shall be used.

289
290 Bronze service clamps shall be used in corrosive soil. Saddles,
291 straps, nuts, and washers shall be bronze. For cast iron pipe, service clamps
292 shall be non-corrosive material that is compatible with cast iron.

293
294 Service clamps with outlets tapped shall have tapered threads of size
295 specified. Clamps shall have neoprene gaskets. Ductile iron clamps shall
296 be painted with tar and base paint.

297
298 **707.12 Spiral Rib Metal Pipe.**

299
300 **(A) Spiral Rib Steel Pipe.** Spiral rib steel pipe shall be zinc coated
301 conforming to AASHTO M 36 and Subsection 707.02 - Corrugated Metal
302 Pipe and Pipe Arch except corrugation and fabrication requirements.

303
304 Spiral rib steel pipe shall have continuous helical rib and continuous
305 helical lock seam with rib spaced midway between seams. Ribs shall be:

- 306
307 **(1)** 3/4 inch wide by 1 inch high at 11-1/2 inches on centers.
308
309 **(2)** 3/4 inch wide by 3/4 inch high at 7-1/2 inches on centers.
310
311 **(3)** 3/4 inch wide by 5/8 inch high at 12 inches on centers (SRP-II).

312
313 Maximum size diameter for SRP-II pipe shall be 42 inches.

314 Continuous helical lock seam shall be fabricated according to AASHTO M 36
315 and Subsection 707.02 - Corrugated Metal Pipe and Pipe Arch.

316

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

320

321 Spiral rib aluminum pipe shall have three continuous helical ribs and
322 continuous helical seam. Ribs shall be:

323

324 (1) 3/4 inch wide by 1 inch high at 11-1/2 inches on centers.

325

326 (2) 3/4 inch wide by 3/4 inch high at 7-1/2 inches on centers.

327

328 (3) 3/4 inch wide by 5/8 inch high at 12 inches on centers (SRP-II).

329

330 Maximum size diameter for SRP-II pipe shall be 30 inches.
331 Continuous helical lock seam shall be fabricated in accordance with
332 AASHTO M 196 and Subsection 707.02 - Corrugated Metal Pipe and Pipe
333 Arch.

334

335 **707.13 Spiral Rib Coupling Band.** Coupling bands shall conform to Subsection
336 707.02 - Corrugated Metal Pipe and Pipe Arch and AASHTO M 196 for aluminum
337 pipe and AASHTO M 36 for steel pipe.

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END OF SECTION 707