



## Iowa Department of Transportation

### SPECIAL PROVISIONS FOR CORRUGATED METAL CULVERTS

Pottawattamie County  
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Effective Date  
June 16, 2015

THE STANDARD SPECIFICATIONS, SERIES 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

#### 120316.01 DESCRIPTION.

- A. This section includes:
- Prefabricated Corrugated Steel Pipe,
  - Bituminous Coated Corrugated Steel Pipe,
  - Corrugated Aluminum Alloy Pipe, and
  - Polymeric Coated Galvanized Corrugated Steel Pipe.
- B. These specifications shall govern the fabricating, furnishing, and installation of pipe culverts of the types and construction above, all in accordance with these specifications, the special provisions and the details shown on the plans.
- C. The size, type, length, wall thickness, coating/paving requirements and location of pipe culverts will be shown on the plans or as directed by the Engineer.
- D. Where corrugated pipe is referred to in these specifications, the same shall include corrugated steel pipe and corrugated aluminum alloy pipe unless otherwise noted. Corrugated aluminum pipe-arch shall not be used.
- E. Where pipe is referred to in these specifications all of the above noted acceptable types of pipe are included unless otherwise noted.

#### 120316.02 MATERIALS.

- A. **Prefabricated Corrugated Steel Pipe.**
1. Prefabricated corrugated steel pipe shall be aluminized steel pipe or bituminous coated galvanized steel pipe.

2. Fabrication and materials shall be in accordance with Chapter 1, Part 4, Section 4.3 of the AREMA Manual for Railway Engineering except as specified hereinafter:

**a. Article 4.3.1.2.**

Fabricator may furnish either Class I or Class II corrugated steel pipe with either applicable type seam for Class II pipe when class or seam type is not specified.

**b. Article 4.3.3.**

When step beveled ends are specified on corrugated steel pipes, the vertical step at the top and the bottom of the pipe is to be one-quarter of the pipe diameter in height.

**c. Article 4.3.3.1.**

Table 120306.02-1 shall govern in lieu of Table 4.3.1 - Corrugations:

**Table 120306.02-1: Steel Pipe Corrugations**

Class	Diameter	Nominal Size	Max. Pitch	Min. Inside Radius
I	8" - 48"	2 2/3" x 2"	2 3/4"	11/16"
II	12" - 48"	2 2/3" x 2"	2 3/4"	11/16"

Notes:

- Pitch is measured at right angles to the corrugation.
- Depth shall not overrun by more than 5%.

**d. Article 4.3.4.**

**a.** For Class II corrugated steel pipe, the ends of individual pipe sections shall be re-rolled to form circumferential corrugations extending at least two corrugations from the pipe end.

**b.** Bands with projections shall not be furnished. Corrugated locking bands shall be furnished. ("Hugger" type or approved equal.)

**c.** Bolts for coupling bands shall be 6 inches long and threaded within 1 inch of the head.

**e. Shipping.**

**a.** Corrugated steel pipe having invert paving shall be shipped with paving at bottom.

**b.** Blocking shall be placed between all corrugated steel pipe sections when loaded to prevent longitudinal movement during shipment. This blocking is in addition to the customary straps to the floor surface.

**B. Bituminous Coated Corrugated Steel Pipe.**

Bituminous coated galvanized corrugated steel pipe shall be in accordance with Chapter 1, Part 4, Section 4.4.1 of the AREMA Manual for Railway Engineering.

**Table 120316.02-2: CMP PIPES**

Nominal Diameter (Inches)	Nominal* Corrugation (Inches)	Minumum ** Width Of Lap (Inches)	Material Thickness Nominal (Inches)	Material Thickness U.S. Std. Gage	Rivet** Diameter (Inches)	Maximum Cover (Feet)
12	2 2/3 x 1/2	1 1/2	0.109	12	3/8	80
18	2 2/3 x 1/2	1 1/2	0.109	12	3/8	86
21	2 2/3 x 1/2	1 1/2	0.109	12	3/8	74
36	2 2/3 x 1/2	2	0.109	12	3/8	40

\*Where two types of culvert are acceptable, the use of standard 2 2/3" x 1/2"  
 \*\* for riveted pipe

**C. Corrugated Aluminum Alloy Pipe.**

Fabrication and materials shall be in accordance with Chapter 1, Part 4, Section 4.5 of the AREMA Manual for Railway Engineering except as specified hereafter:

**1. Article 4.5.1.2.**

Fabricator may furnish either Class I or Class II corrugated aluminum alloy pipe with either applicable type seam for Class II pipe when class or seam type is not specified.

**2. Article 4.5.3.**

When step beveled ends are specified on corrugated aluminum alloy pipes, the vertical step at the top and the bottom of the pipe is to be one-quarter of the pipe diameter in height.

**3. Article 4.5.3.2.**

Table 120316.02-3 shall govern in lieu of Table 4.5.3.

**Table 120316.02-3: Aluminum Alloy Pipe Corrugations**

Class	Diameter	(1) Pitch Minimum	(1) Pitch Maximum	(2) Depth
I	12"-30"	2-1/4"	2-3/4"	2"
I	36"-72"	2-3/4"	3-1/4"	1"
II	12"-30"	2-1/4"	2-3/4"	2"
II	36"-72"	2-3/4"	3-1/4"	1"

Notes:

1. Pitch is measured at right angles to the corrugation.
2. Depth shall not overrun by more than 5%.

**4. Article 4.5.4.**

- a. Bands with projections shall not be furnished. Corrugated locking bands shall be furnished. ("Hugger" type or approved equal.)
- b. Bolts for coupling bands shall be 6 inches long and threaded within 1 inch of the head.
- c. Coupling bands utilizing a slip seam shall not be furnished.

**D. Polymeric Coated Galvanized Corrugated Steel Pipe.**

Polymeric Coated Galvanized Corrugated steel pipe shall be in accordance with Chapter 1, Part 4, Section 4.4.2 of the AREMA manual (which states the polymeric coating shall be in accordance with AASHTO specification M-246).

**E. Handling.**

1. Material shall be handled to final position in such a manner as to prevent its damage.
2. Corrugated pipes materials shall not be dropped to, or dragged over, the ground, but shall be handled with rolling slings, on skids, or with cranes. Corrugated steel pipe, when paved, shall be stored with paved invert at bottom.
3. Corrugated steel pipe may be asphalt coated and paved, and any damage to coating or paving shall be repaired by the Contractor applying two coats of bituminous materials supplied by the Contractor. No extra payment will be allowed for this repair material or work unless authorized in writing by the Engineer.
4. Bent or otherwise damaged corrugated pipe materials shall be straightened and repaired, if feasible and as directed by the Engineer, before being placed in final position. No extra payment will be allowed for this work unless authorized in writing by the Engineer.

5. Materials must be properly stored if extended time will elapse prior to installation. Pipe coatings or pipe materials affected by UV rays or temperature extremes should be stored under a protective shelter until they can be properly installed.
6. Culvert pipes shall be handled carefully to avoid damaging the protective or metallic coatings and denting the metal, or changing its shape in any manner. The use of lifting lugs shall be required when such use will minimize possible damage to the pipe.

**F. Pipe Connections.**

1. Pipe connections shall be shown on the plans or as stated in the specifications.
2. Concrete collars or expanding bands, as shown on the plans, shall be used for pipe connections and attached so as to not be pulled apart. The cost for this connection is incidental to the unit price for culvert pipe and will not be paid as a separate line item.

**G. Aprons.**

Use metal pipe aprons that meet the requirements of Section 4141 of the Standard Specifications.

**120316.03 CONSTRUCTION.**

**A. Foundation Preparation.**

1. The foundation shall be a smoothed and compacted surface conforming to bottom of pipe grade or camber and will hereafter be referred to as the foundation line. The foundation bed shall be free of boulders, tree stumps, cut-off piling, and other projections. Suitable camber to allow for settlement of pipe due to consolidated foundation material will be provided when required. Shaping to pipe contour is not required.
2. Natural material shall be excavated, with vertical sides, to a depth of 1 foot or more below the foundation line as directed by the Engineer and backfilled with selected material to the foundation line. Selected bedding backfill shall be compacted to the full amount required by Section 2107 of the Standard Specifications. The width of excavation and bedding backfill shall be three pipe diameters for single pipes, and for multiple pipes, this width shall be increased by the distances between pipe centers. Soft, spongy or otherwise unsuitable material encountered at the established and approved grade shall be removed and backfilled with granular material as directed by the Engineer.

**B. Protection of Foundations.**

The Contractor shall by diversion ditches, dikes, or other means, keep the foundations free of water at all times after the work is started, and until the embankment is placed over the pipe. Any channel work necessary to allow free flow through the pipe shall be completed before the embankment is placed.

**C. Placing Corrugated Pipe.**

1. Where two or more pipes are used, there shall be a minimum of 3 feet, or one-half pipe diameter, clear distance apart, whichever is greater.
2. Pipe having riveted seams shall be laid with outside laps of circumferential joints pointing upstream, longitudinal laps on the sides and asphalt paving on the flow line.

3. Pipe sections shall be firmly joined together with connecting bands. All dirt or other foreign materials must be kept out from between pipe and band. Outside connecting bands should be slipped over the end of one section, and the adjoining section brought within 1 inch of the first. Band shall be made to fit snugly and equally on each pipe section and bolted to produce a tight joint. The lower half of two-piece connecting bands for pipe having riveted seams may be furnished already connected to one of the pipe sections, and in such cases the end having the fixed half band shall be placed downstream. Band couplers and ends of pipe under the bands may be lubricated with oil or solvent, which has been approved by the Engineer. Excess asphalt at joints may be removed by an application of heat, if necessary. Where corrugated pipe is to be placed in an irrigation ditch, continuous waterway or spring area, rubber gaskets shall be placed around the first re-rolled corrugation at each end of the pipe before the band is placed to keep the joint watertight.
4. Identification tag, supplied by manufacturer, shall be attached near top of and inside of pipe at upstream end.

#### **D. Backfill and Embankment.**

##### **1. Backfill Around Pipes.**

When the pipe foundation line is below natural ground, compacted backfill, placed in accordance with Article 120316.03, D, 2, shall be placed around the pipe in the area within the limits of the prepared foundation. The upper limit of this backfill shall be the top of pipe elevation or the elevation of natural ground surface as it existed before any excavation was made, whichever is lower. Embankment above natural ground shall be placed in accordance with Article 120316.03, D, 2. When the upper limit of backfill is the top of pipe elevation, a 3-foot depth of material shall be placed above the pipe without compaction. This material shall be compacted in accordance with Article 120316.03, D, 2 at the time the roadbed receives its final finish.

##### **2. Embankment Around Pipes.**

- a. The placing of embankment around pipes is to be started with the approval of the Engineer only after assembly and erection work has been completed in every detail. Embankment material to be placed around pipe must be approved by the Engineer.
- b. Embankment under the haunches, along each side for a minimum width equal to the pipe diameter, and over the pipe is to receive special handling both as to placing and as to compaction. Except as modified by the provisions of Article 120316.03, D, 2, c, embankment shall be hand tamped directly under the haunches throughout the width, beyond the reach of machine compacting equipment. Embankment around pipes shall be brought up in compacted layers with a depth of less than 6 inches before compaction on both sides of the pipe at the same time keeping the fill at the same elevation on both sides. All material, except as noted in Article 120316.03, D, 2, c and Article 120316.03, D, 2, d, shall be compacted to the full amount required by Section 4107 of the Standard Specifications. Compaction methods and equipment shall be approved by the Engineer.
- c. If the Engineer permits the clear distance between multiple pipes, or the clear distance between pipe and cut face, to be less than 3 feet, lean concrete slurry shall be used to fill under the haunches and to a minimum depth of the spring lines of the pipe installation. The concrete slurry mix shall be approved by the Engineer. Care shall be taken to ensure that the concrete slurry does not float the pipes above their intended elevation.
- d. The embankment directly above the pipe for a distance of one-third pipe diameter, but not less than 3 feet is to be placed without compaction.
- e. Where the distance from subgrade to top of pipe is less than 3 feet, the excess material shall be left in place until the roadbed receives its final finish. At this time the material over the pipe to a depth of 1 foot below subgrade elevation shall be compacted to the full amount required by Section 4107 of the Standard Specifications.

- f. Care must be taken to prevent water from leaking through the fill or along the side of the pipe. When granular materials have been used for bedding or backfill, the ends of such material must be sealed against infiltration. This can be done by using impervious embankment material for 3 feet at both ends of the pipe.

**120316.04 METHOD OF MEASUREMENT.**

Measurement for the items associated with corrugated pipe culverts will be as follows:

**A. Pipe culvert.**

Measured length, in feet, of culvert installed, excluding aprons, to the nearest foot. Quantity of pipe will be determined along the axis.

**B. Aprons.**

Quantity shown in the contract documents.

**C. Appurtenances (elbows, tees, and other fittings).**

Not measured for payment.

**D. Excavation for culverts.**

Article 2402.04, C of the Standard Specifications applies.

**120316.05 BASIS OF PAYMENT.**

Payment for the items associated with corrugated pipe culvert will be at the contract unit price as follows:

**A. Pipe culvert.**

Per linear foot for type and size specified.

**B. Aprons.**

Per unit for the size specified.

**C. Appurtenances.**

Included in the contract unit price per linear foot (meter) for the pipe culvert.

**D. Excavation for culverts.**

Per cubic yard.