

# CONSTRUCTION NOTES

## GENERAL:

These structures are designed for Cooper E80 live load with impact, and cover as shown in Table 1.

Generally, 30 inch diameter and larger Corrugated Steel Pipe (CSP) is preferred for mainline culverts. Smaller pipes are to be used for local drainage.

Table 1 indicates the minimum required gage thickness for structural stability.

## INSTALLATION:

1. Installation of CSP shall conform to the current American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering, Chapter 1, Part 4. Culvert lengths are to be based on standard mainline roadbed sections.
2. These standards are for installation in soil with a pH of 5-9 and resistivity  $\geq 1,500$  ohm-cm. Pipes located in soils outside this range shall have additional corrosion protection as specified by the engineer.
3. Wire or timber strutting used during installation must be removed immediately after installation and backfill are complete.
4. Pipe culverts will generally be joined using 2 foot wide locking corrugated metal connecting bands. The inside of corrugated connecting bands and the outside of pipe culverts to be joined by corrugated connecting bands shall be kept clean and free of all rust, dirt or gravel. The corrugations on the connecting bands and the pipe culvert shall fit snugly as the connecting bands are tightened.
5. Corrugated steel pipe culverts must be placed with the inside circumferential laps pointing downstream.
6. Culverts resting on rock foundation need not be cambered. Unless otherwise specified by the engineer all other CSP culverts shall be cambered in accordance with the following:
  - A. Embankments up to 8 feet high (measured base of rail to flowline) require a  $1\frac{1}{2}$  inch camber.
  - B. Embankments 8 feet to 12 feet high require a  $2\frac{1}{2}$  inch camber.
  - C. Embankments 12 feet to 18 feet high require a 4 inch camber.

In no case shall the culvert be cambered so high in the center that water will be pocketed at the inlet end of the pipe.

## PIPE MATERIAL SPECIFICATIONS, FABRICATION AND TOLERANCE:

1. CSP material shall be in accordance with the current AREMA Manual for Railway Engineering, Chapter 1, Part 4, Section 3.
2. The pipe shall be fabricated, assembled into sections and furnished as follows:

### 12", 18", 21", AND 24" DIAMETER ONLY:

Class 1 with  $2\frac{2}{3}$ " x  $\frac{1}{2}$ " annular corrugations. Shape 1, vertical elongation is not required. Single riveted longitudinal seams.

### 30" DIAMETER AND GREATER:

Class 1 with 3" x 1" annular corrugations (30 inch pipes may have  $2\frac{2}{3}$ " x  $\frac{1}{2}$ " annular corrugations). Shape 2, factory elongated with vertical length 5% greater than the nominal diameter. Double riveted seams.

### ALL CSP DIAMETERS:


Square cut ends.  
Two lifting lugs per preassembled section.  
Lifting hardware for erection and installation.  
Aluminized Type 2 per American Association of State Highway and Transportation Officials (AASHTO) M274 (96 inch diameter pipes shall be galvanized).

3. Permanently attach an identification plate inside the pipe near the end of the segment. The plate is to contain the following information in at least  $\frac{1}{4}$  inch high letters:
  - Name of manufacturer and plant location
  - Date assembled
  - Gage
  - Diameter
  - Length

The same information plus the lifting weight shall be stenciled on the outside face of the pipe.
4. The inside diameter of the circular pipe shall not vary more than  $\frac{1}{2}$  inch from the nominal diameter when measured on the inside crest of the corrugations for diameters through 48 inches, and 1% for diameters greater than 48 inches. In no case shall the difference in the diameter of the abutting pipe ends be more than  $\frac{1}{2}$  inch.
5. The minimum width of the longitudinal lap is  $1\frac{1}{2}$  inches for all pipes with nominal inside diameter of 12 to 21 inches, 2 inches for pipes with nominal inside diameter of 24 inches or 30 inches, and 3 inches for all pipes with nominal inside diameter of 36 inches or greater.

## 6. Riveted Seams:

- A. All 14 gage pipe shall have at least  $\frac{5}{16}$  inch diameter rivets. All 12 gage and thicker pipe shall have at least  $\frac{7}{16}$  inch diameter rivets.
  - B. Longitudinal seams shall be riveted with one rivet in each corrugation valley for all pipes 24 inches in diameter and smaller. Longitudinal seams shall be riveted with two rivets in each corrugation valley for all pipes larger than 24 inches. Circumferential seams shall be riveted with a maximum rivet spacing of six inches.
  - C. All rivets shall be cold driven in such a manner that the metal shall be drawn tightly together throughout the entire lap. The center of each rivet shall not be closer than two rivet diameters from the edge of the sheet. All rivets shall have full hemispherical heads or heads of a form acceptable to the engineer. They shall be driven in a workmanlike manner to completely fill the hole without bending.
  - D. Rivets shall conform to the specifications of ASTM International A31, Grade A and shall be electroplated in accordance with the specifications of ASTM International A164, Type RS.
7. Pipes shall be jointed with locking coupling bands in accordance with the provisions of the AREMA Manual for Railway Engineering Chapter 1, Part 4, Section 4.3.4. Coupling bands shall be of the same base metal and finish as the pipe. Coupling bands shall be 24 inches wide for pipes 30 inch diameter and larger. Smaller pipes may use 7 inch wide bands. Coupling band thickness is shown in Table 1.

REVISIONS			DESIGN BY: CLJ	DRAWN BY: KDM	CHECKED BY: CLJ
DATE	LTR.	DESCRIPTION	APPROVED:		
/			 4/4/08 <b>UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN</b>		
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## BRIDGE STANDARDS

### CONSTRUCTION NOTES AND TABLE FOR CORRUGATED STEEL PIPE CULVERTS


FILE OWNER: UPRR	DATE:
PLAN NO.: 680020	SHEET: 1 OF 2

FILE NAME: P:\dgn\standards\Culverts (Pipe)\steel\pip\_std.dgn

TABLE 1 - ROUND CORRUGATED STEEL PIPE (CSP)

INSIDE PIPE DIAMETER	GAGE	THICKNESS (IN.)	WEIGHT (LB./FT.)	COVER *		10'-0" LENGTH		12'-0" LENGTH		14'-0" LENGTH		16'-0" LENGTH		18'-0" LENGTH		20'-0" LENGTH		22'-0" LENGTH		24'-0" LENGTH		CONNECTING BANDS	
				MIN. (FT.)	MAX. (FT.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)	ITEM NO.	WEIGHT (LB.)
12"	14	0.079	12	1'-6"	18'-0"	510-2975	120	510-2976	144	-	168	-	192	-	216	510-2977	240	-	264	510-2978	288	-	16
18"	14	0.079	18	1'-6"	18'-0"	510-2979	180	510-2980	216	-	252	-	288	-	324	510-2981	360	-	396	510-2982	432	-	16
21"	14	0.079	21	1'-6"	18'-0"	510-2983	210	510-2984	252	-	294	-	336	-	378	510-2985	420	-	462	510-2986	504	-	16
24"	14	0.079	24	1'-6"	18'-0"	510-2987	240	510-2988	288	-	336	-	384	-	432	510-2989	480	-	528	510-2990	576	510-3123	16
30"	14	0.079	30	1'-6"	18'-0"	-	300	-	360	510-3045	420	510-3046	480	510-3047	540	510-3048	600	510-3049	660	510-0345	720	510-3124	16
36"	14	0.079	41	2'-6"	18'-0"	-	410	-	492	510-3055	574	510-3065	656	510-3066	738	510-3067	820	510-3068	902	510-3069	984	510-3130	16
42"	14	0.079	47	2'-6"	18'-0"	-	470	-	564	510-3073	658	510-3074	752	510-3075	846	510-3077	940	510-3078	1,034	510-3079	1,128	510-3132	16
48"	12	0.109	74	2'-6"	18'-0"	-	740	-	888	510-3081	1,036	510-3082	1,184	510-3083	1,332	510-3084	1,480	510-3085	1,628	510-3086	1,776	510-3138	14
60"	12	0.109	92	2'-6"	18'-0"	-	920	-	1,104	510-3087	1,288	510-3088	1,472	510-3089	1,656	510-3091	1,840	510-3092	2,024	510-3093	2,208	510-3150	14
72"	10	0.138	140	3'-6"	18'-0"	-	1,400	-	1,680	510-3100	1,960	510-3101	2,240	510-3102	2,520	510-3103	2,800	510-3104	3,080	510-3105	3,360	510-3158	12
84"	10	0.138	164	3'-6"	18'-0"	-	1,640	-	1,968	510-3114	2,296	510-3115	2,624	510-3116	2,952	510-3117	3,280	510-3118	3,608	510-3113	3,936	510-3176	12
96"	8	0.168	228	3'-6"	18'-0"	-	2,280	-	2,736	510-3181	3,192	510-3182	3,648	510-3183	4,104	510-3184	4,560	510-3185	5,016	510-3186	5,472	510-3188	10

\* COVER TO BE MEASURED FROM BASE OF RAIL TO TOP OF PIPE

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DATE	LTR.	DESCRIPTION	APPROVED:		
6/13	A	CORRECTED ITEM NUMBER	 4/4/08 UPRR - MGR SPECIAL PROJECTS STRUCTURES DESIGN		
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