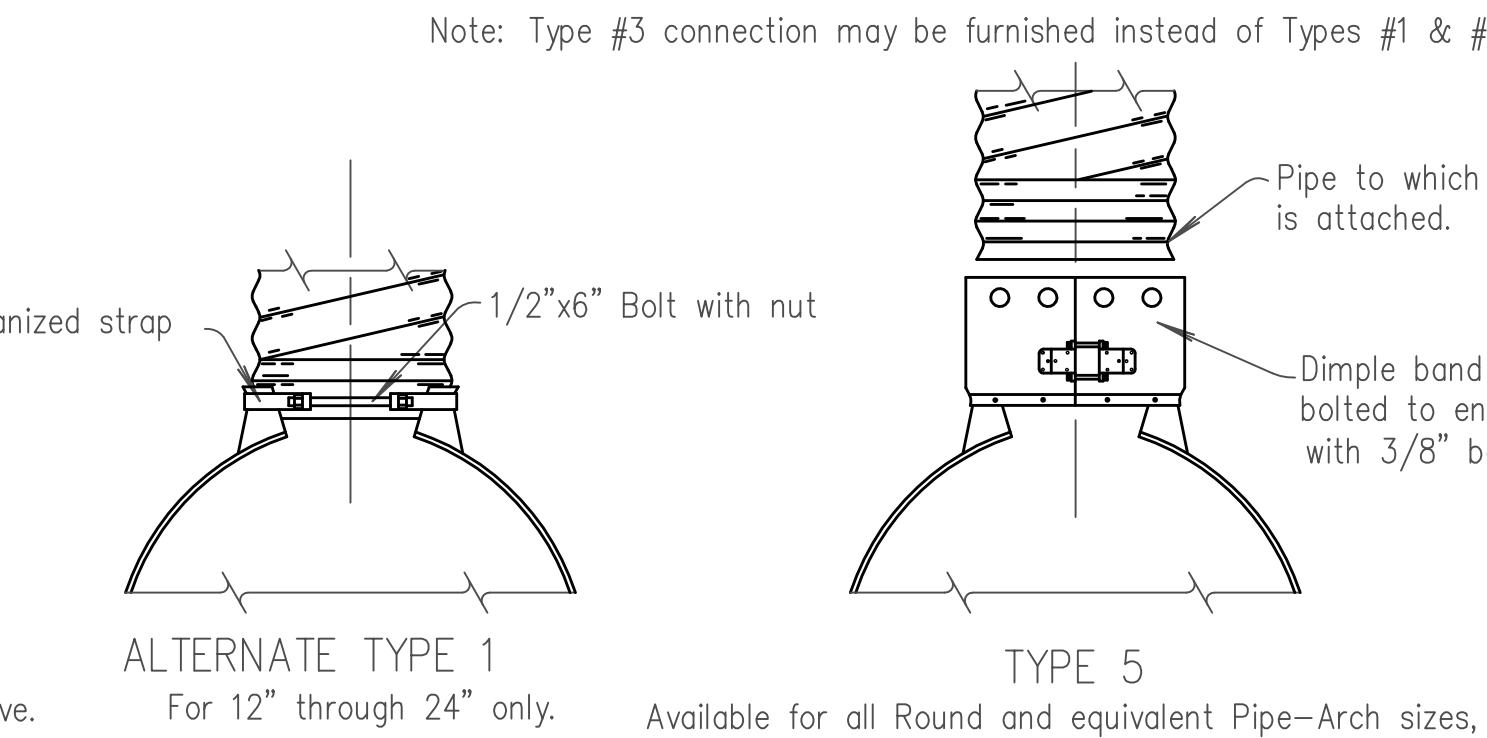
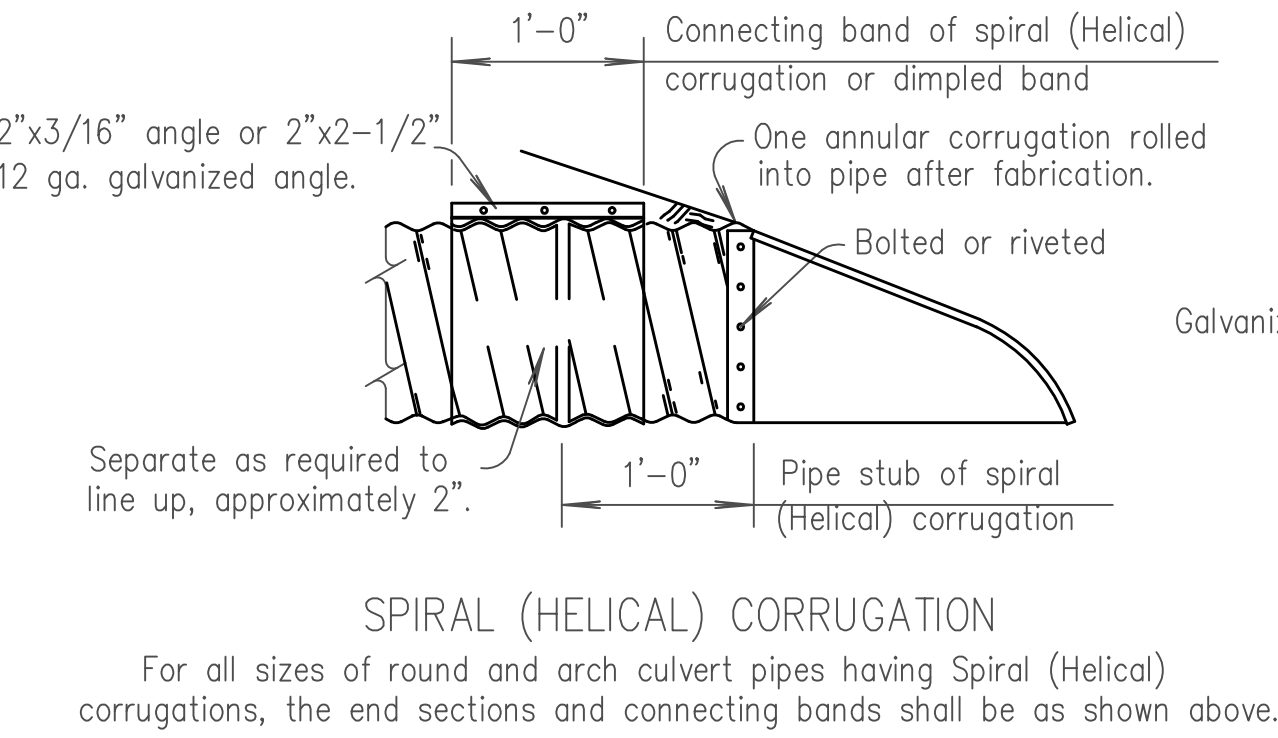
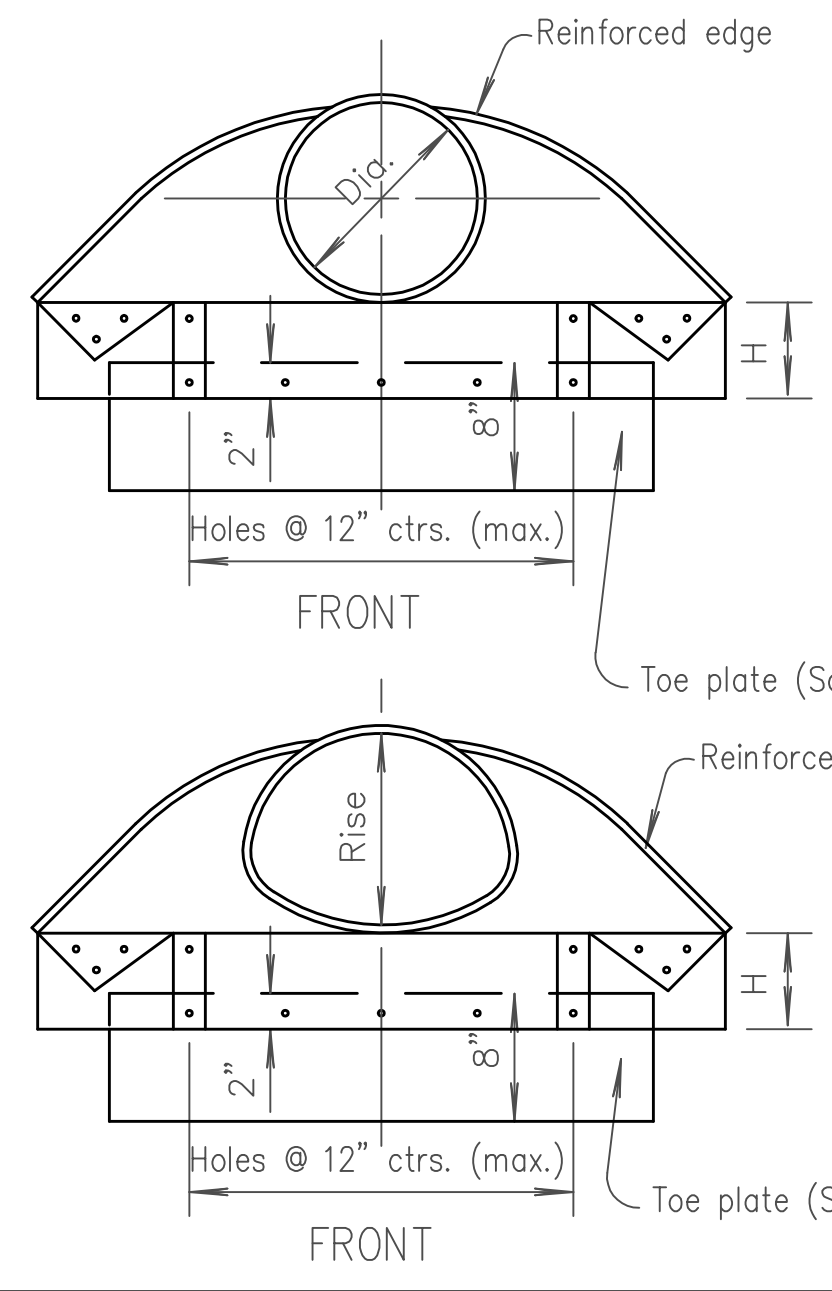


NOTE: Toe plate, where specified, to be punched to match holes in apron lip. 3/8" Dia. galvanized bolts to be furnished. The length of toe plate to be as follows:
W + 10" for 12" to 30" diameter pipes inclusive.
W + 20" for 36" to 84" diameter pipes inclusive.
W + 10" for pipe-arches with a rise of 13" to 29" inclusive.
W + 20" for pipe-arches with a rise of 33" to 59" inclusive.
Apron section for 12" to 24" diameter pipe inclusive, and pipe-arches with rise of 13" to 24" inclusive, to be made from one sheet. Apron sections for 30" to 42" diameter pipe inclusive, and pipe-arches with rise of 29" to 33" inclusive, may be made from up to two sheets joined by riveting or bolting on the center-line apron section. Apron section for 48" to 72" diameter pipe inclusive, and pipe-arches with rise of 38" to 63" inclusive, may be made from up to three sheets joined by riveting or bolting at equal distances from centerline. Apron sections for 78" diameter pipe and above and pipe-arches with rise 67" and above may be made from up to four sheets joined by riveting or bolting.
Corner sections, corner plate and toe plate to be same gauge as apron and each to be galvanized in accordance with the specifications.
Other approved designs may be used in lieu of type shown.



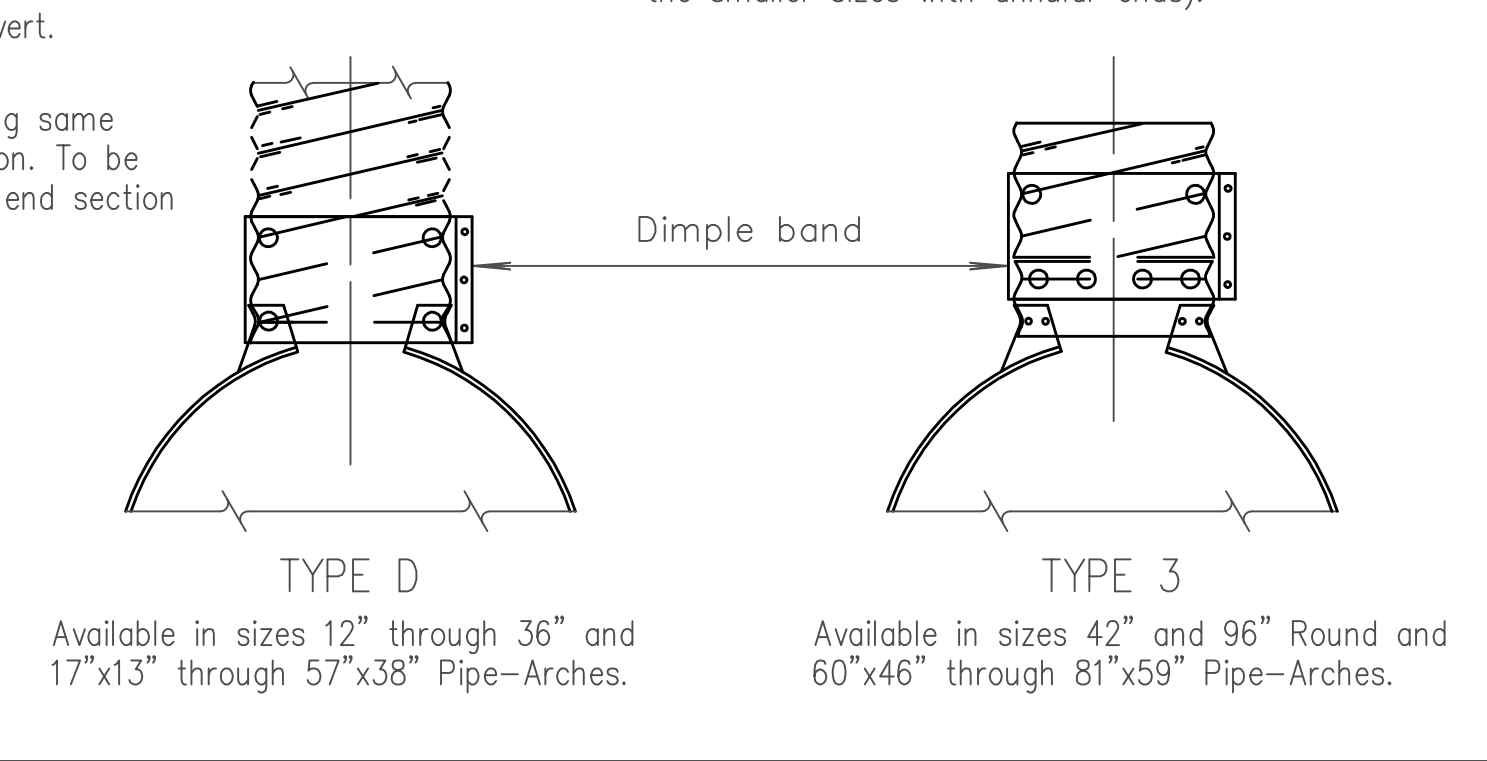
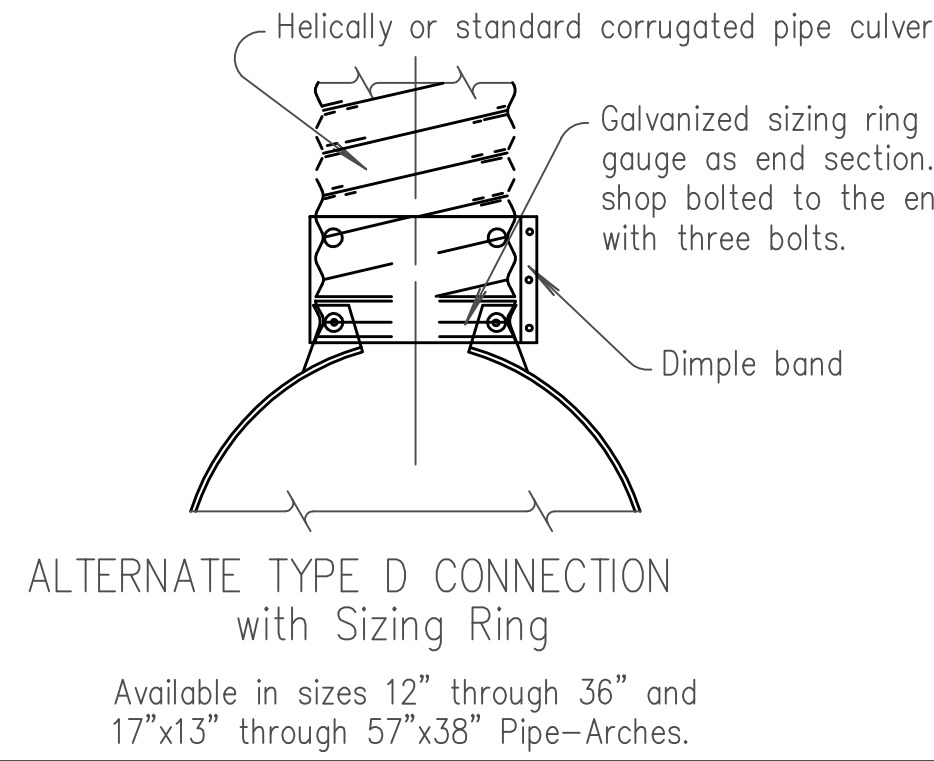
Note: Type #3 connection may be furnished instead of Types #1 & #2 for smaller sizes of pipe and pipe arches.

SPIRAL (HELICAL) CORRUGATION
For all sizes of round and arch culvert pipes having Spiral (Helical) corrugations, the end sections and connecting bands shall be as shown above.

ALTERNATE TYPE 1
For 12" through 24" only.
TYPE 5
Available for all Round and equivalent Pipe-Arch sizes, (Type 1 and Type 2 connections are recommended for the smaller sizes with annular ends).

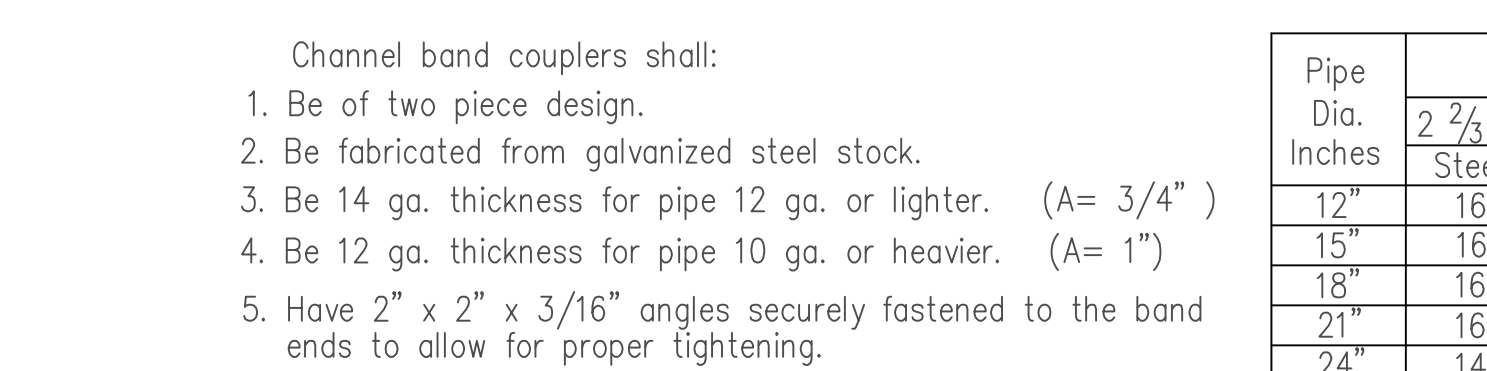
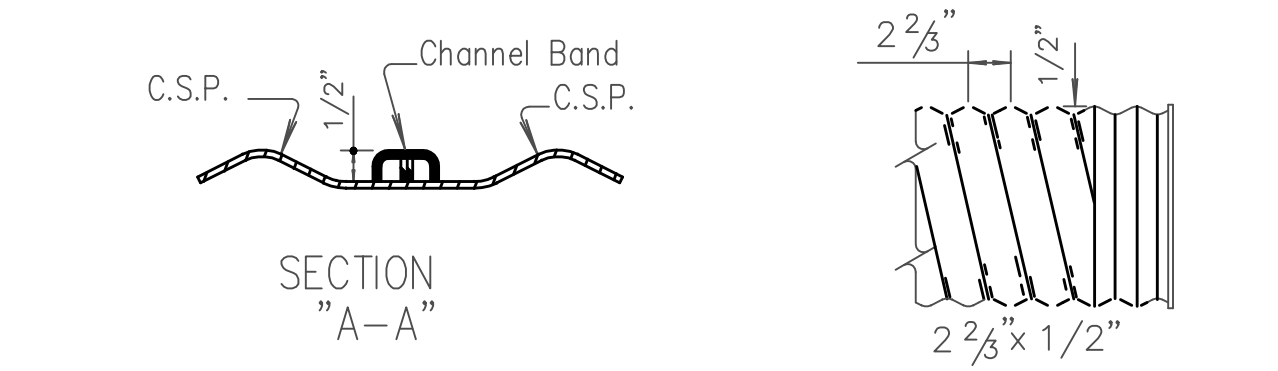
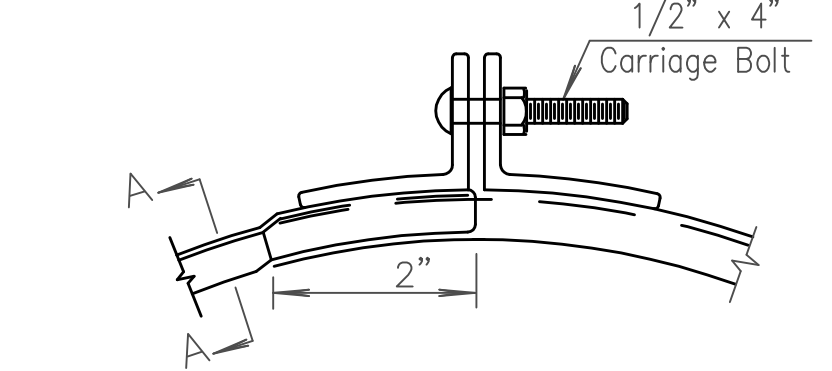
Bid Designation Sq. Ft.	Nom. W.W. Area Sq. Ft.	Pipe Arch		Min. Gauge End Sect.	Dimensions in Inches						No. Apron Panels	Slope
		Span (In.)	Rise (In.)		A 1" Tol.	B Max.	H 1" Tol.	L 1-1/2" Tol.	W 2" Tol.			
1.0	1.1	17	13	16	7	9	6	19	30	1	2-1/2 : 1	
1.5	1.6	21	15	16	7	10	6	23	36	1	2-1/2 : 1	
2.0	2.2	24	18	16	8	12	6	28	42	1	2-1/2 : 1	
2.5	2.8	28	20	16	9	14	6	32	48	1	2-1/2 : 1	
Sizes below with alternate dimensions												
3.0 or 4.0	4.4	35	24	14	10	16	6 & 8	39	60	1	2-1/2 : 1	
5.0 or 6.0	6.4	42	29	14	12	18	8 & 9	46	75	2	2-1/2 : 1	
7.0 or 8.5	8.7	49	33	12	13	21	9 & 12	53	85	2	2-1/2 : 1	
10.0 or 11.0	11.4	57	38	12	18	26	12	63	90	2	2-1/2 : 1	
12.5 or 14.0	15.6	60	46	12	18	30 & 34	12	70	102	2	2 : 1	
16.5	19.3	66	51	12 & 10	18	33	12	77	114 & 116	3	1-1/2 : 1	
21.0	23.2	73	55	12 & 10	18	36	12	77	126	3	1-1/2 : 1	
25.0	27.4	81	59	12 & 10	18	39	12	77	138	3	1-1/2 : 1	
32.0	32.1	87	63	12 & 10	22	38	12	77	148	3	1-1/2 : 1	
36.0	37.0	95	67	12 & 10	22	34	12	77	162	3	1-1/2 : 1	
42.0	42.4	103	71	12 & 10	22	38	12	77	174	3	1-1/2 : 1	
47.0	48.0	112	75	12 & 10	24	40	12	77	174	3	1-1/2 : 1	

Pipe Dia. (In.)	Min. Gauge Ends	Dimensions in Inches						No. Apron Panels	Slope
		A 1" Tol.	B Max.	H 1" Tol.	L 1-1/2" Tol.	W 2" Tol.			
12"	16	6	6	6	21	24	1	2-1/2 : 1	
15"	16	7	8	6	26	30	1	2-1/2 : 1	
18"	16	8	10	6	31	36	1	2-1/2 : 1	
21"	16	9	12	6	36	42	1	2-1/2 : 1	
24"	16	10	13	6	41	48	1	2-1/2 : 1	
30"	14	12	16	8	51	60	1	2-1/2 : 1	
36"	14	14	19	9	60	72	2	2-1/2 : 1	
42"	12	16	22	11	69	84	2	2-1/2 : 1	
48"	12	18	27	12	78	90	2	2-1/2 : 1	
54"	12	18	30	12	84	102	2	2-1/2 : 1	
60"	12 & 10	18	33	12	87	114	3	2 : 1	
66"	12 & 10	18	36	12	87	120	3	2 : 1	
72"	12 & 10	18	39	12	87	126	3	2 : 1	
78"	12 & 10	18	42	12	87	132	3	1-1/2 : 1	
84"	12 & 10	18	45	12	87	138	3	1-1/2 : 1	
90"	12 & 10	18 & 24	37 & 45	11 & 12	87	138 & 144	3	1-1/2 : 1	
96"	12 & 10	18 & 25	35 & 45	12	87	138 & 150	3	1-1/2 : 1	



ALTERNATE TYPE D CONNECTION with Sizing Ring
Available in sizes 12" through 36" and 17"x13" through 57"x38" Pipe-Arches.

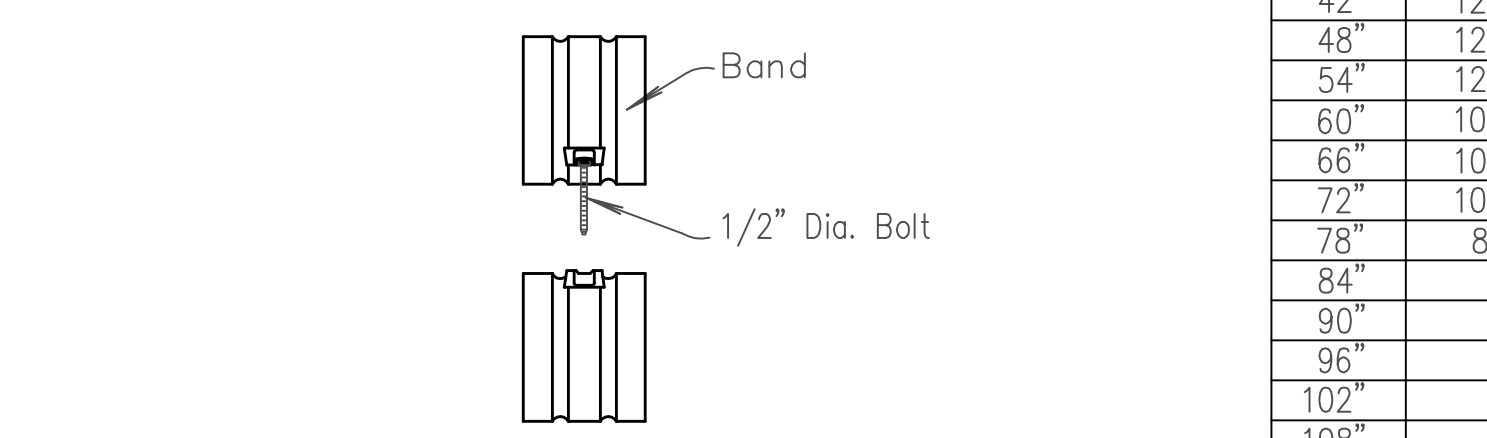
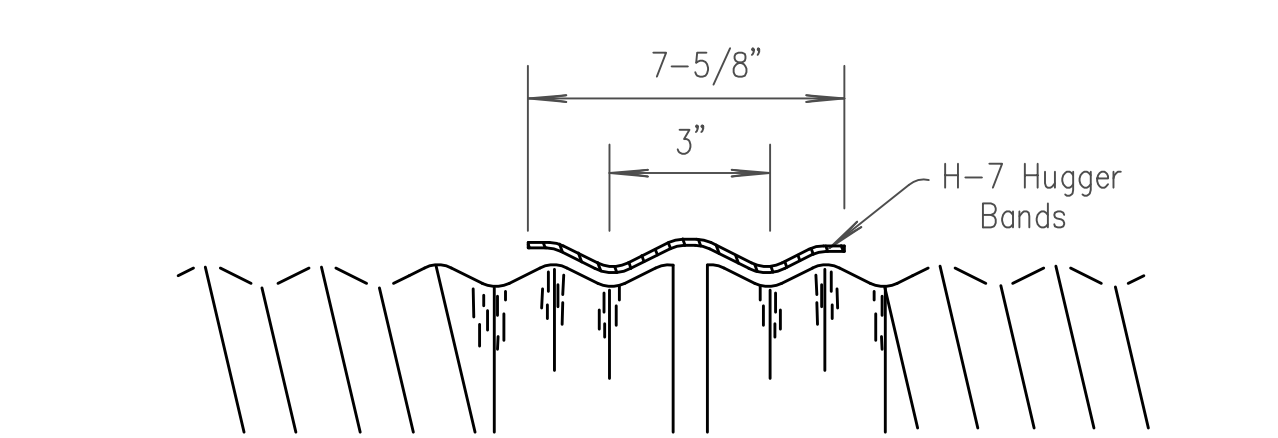
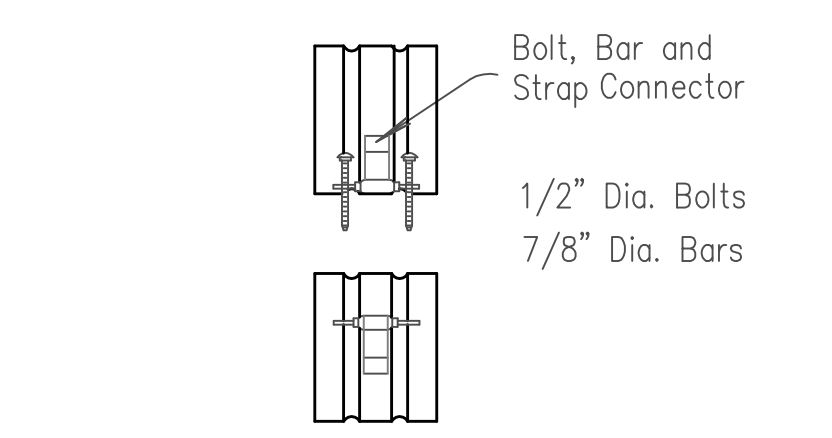
TYPE D
Available in sizes 12" through 36" and 17"x13" through 57"x38" Pipe-Arches.
TYPE 3
Available in sizes 42" and 96" Round and 60"x46" through 81"x59" Pipe-Arches.



- Channel band couplers shall:
- Be of two piece design.
 - Be fabricated from galvanized steel stock.
 - Be 14 ga. thickness for pipe 12 ga. or lighter. (A= 3/4")
 - Be 12 ga. thickness for pipe 10 ga. or heavier. (A= 1")
 - Have 2" x 2" x 3/16" angles securely fastened to the band ends to allow for proper tightening.

CHANNEL BAND DETAILS

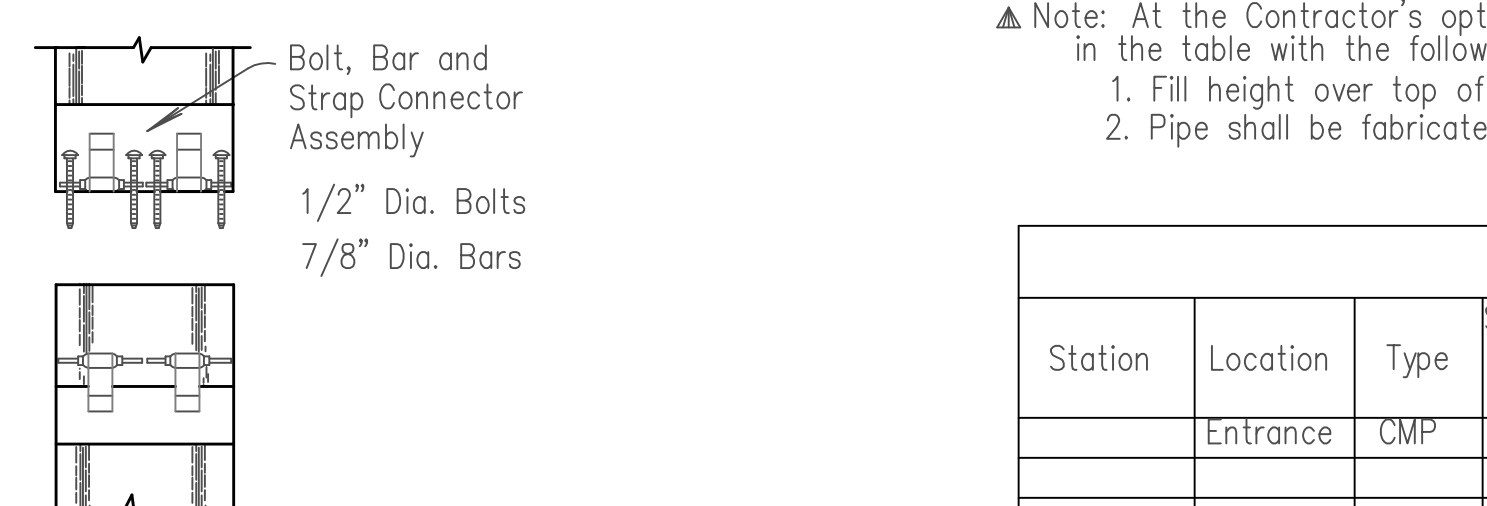
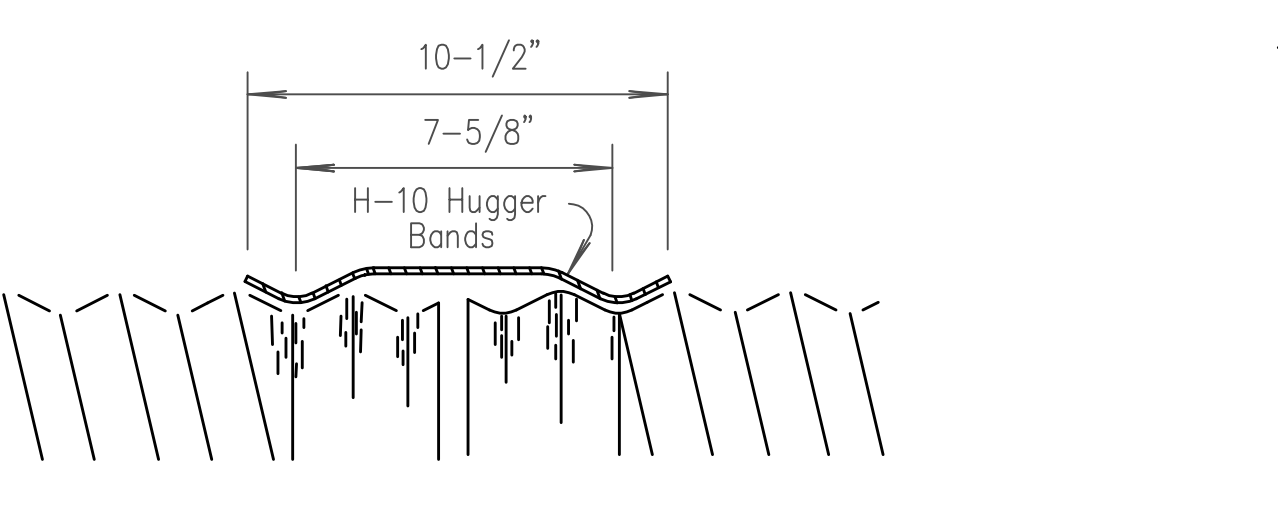
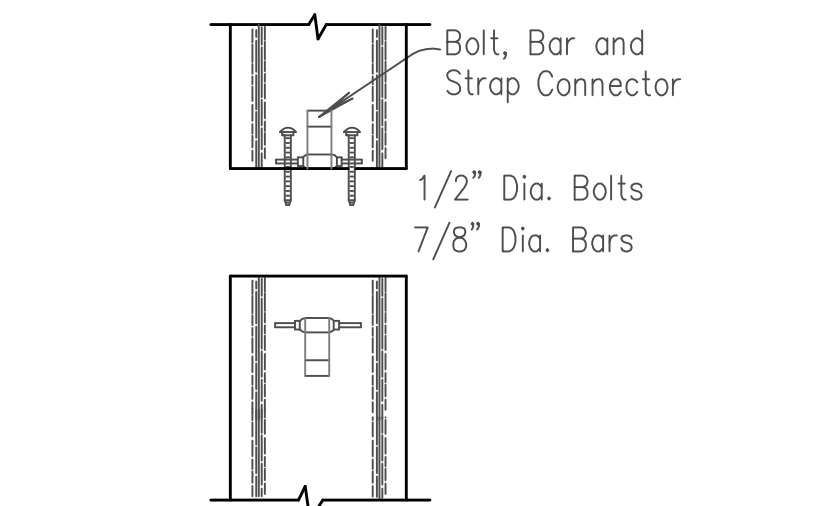
Reformed to accept Channel, Annular, Dimple and Hugger Bands.



ALTERNATE CONNECTION DETAIL

UNIVERSAL REFORMED END with H-7 HUGGER BAND DETAILS FOR H-7 HUGGER BANDS (16 ga.)

STANDARD CONNECTION DETAIL



CONNECTION DETAIL SINGLE HARNESS

UNIVERSAL REFORMED END with H-10 HUGGER BAND DETAILS FOR H-10 HUGGER BANDS (16 ga.)

CONNECTION DETAIL DOUBLE HARNESS

Pipe Dia. Inches	* Minimum Gauge of Pipe			
	2 2/8" x 1/2" Steel	1 1/2" x 1" Alum.	3" x 1" Corr. Steel	6" x 2" Corr. Steel
12"	16	16		
15"	16	16		
18"	16	16		
21"	16	16		
24"	14	14		
30"	14	12		
36"	14	12		16
42"	12	12	14	16
48"	12	10	14	16
54"	12	10	14	16
60"	10	8	14	12
66"	10	8	14	12
72"	10	6	14	12
78"	8		14	12
84"			12	12
90"			12	12
96"			12	12
102"			12	12
108"			10	12
114"			10	12
120"			10	12

Bid Designation Sq. Ft.	Pipe Dimension Span & Rise	Sq. Ft.	* Min. Gauge of Pipe		
			2 2/8" x 1/2" Steel	1 1/2" x 1" Alum.	3" x 1" Corr. Steel
1.0	17" x 13"	1.1	16	16	16
1.5	21" x 15"	1.6	16	16	16
2.0	24" x 18"	2.2	16	16	16
2.5	28" x 20"	2.8	14	14	14
3.0 or 4.0	35" x 24"	4.4	14	12	12
5.0 or 6.0	42" x 29"	6.4	14	12	12
7.0 or 8.5	49" x 33"	8.7	12	12	12
10.0 or 11.0	57" x 38"	11.4	12	10	10
12.5 or 14.0	60" x 46"	15.6	10	10	14
16.5	66" x 51"	19.3		8	14
21.0	73" x 56"	23.2			12
25.0	81" x 59"	27.4			12
32.0	87" x 63"	32.1			12
36.0	96" x 67"	37.0			12
42.0	103" x 71"	42.4			12
47.0	112" x 75"	48.0			12
54.0	117" x 79"	54.2			10
60.0	128" x 83"	60.5			10
67.0	137" x 87"	67.4			10
74.0	142" x 91"	74.5			10

- ▲ Note: At the Contractor's option, 5"x1" corrugated steel pipe of equal gauge may be substituted for the 3"x1" corrugated steel pipe listed in the table with the following restrictions:
- Fill height over top of pipe shall be less than 25 ft.
 - Pipe shall be fabricated with helical corrugations and lock seams or continuous welded seams.

PIPE CULVERT SUMMARY														
Station	Location	Type	Size or Bid Designation Sq. Ft.	Crown Grade Elev.	Flow Line		Horizontal Roadway		Degree of Rotation	Length of Pipe		Lin. Ft. of Pipe	End Sections	
					Lt.	Rt.	Lt.	Rt.		Lt.	Rt.		Lt.	Rt.
	Entrance	CMP	18"	84.22	81.41	81.61	-	-	-	-	-	28'	1	1

Note: The culverts listed on this sheet may not indicate that the culvert installed will be steel, aluminum or reinforced concrete. *For gauge above minimum requirements see summary of culverts.

Connection of end sections by welding will not be permitted. All 3 piece apron sections shall have 12 gauge sides and 10 gauge center panels. Multiple panel apron sections shall have lap seams which are to be tightly jointed by galvanized rivets or bolts at equal distances from center line. For 60" to 120" diameter pipe apron sections, reinforced edges to be supplemented by hot dipped galvanized stiffener angles. The angles to be attached by galvanized nuts and bolts. For 73"x55" and larger pipe-arch sections, reinforced edges to be supplemented by hot dipped galvanized stiffener angles. The angles to be attached by galvanized bolts and nuts. Angle reinforcement shall be placed under the center panel seams on 73"x55" and larger pipe arch apron sections. All references to galvanized metal refer to steel only. Gain in pipe length due to fit of pipe at connecting band shall not be paid for. When Hugger Bands are used the H-7 Hugger Band may be used on circular pipes 36" diameter and smaller and pipe arches 42"x29" and smaller. The H-10 Hugger Band is required for larger size pipes.

1	4-27-98	Added pipe corrugation option note	R.J.S.	J.O.B.
NO.	DATE	REVISIONS	BY	APP'D

KANSAS DEPARTMENT OF TRANSPORTATION

METAL END SECTION FOR ROUND & ARCH METAL CULVERTS (TYPE I) & PIPE GAUGE TABLES

RD660

FHWA APPROVAL	6-15-98	APP'D.	James O. Brewer
DESIGNED	DETAILD	QUANTITIES	TRACED
DESIGN CK.	DETAIL CK.	QUAN. CK.	TRACE CK.