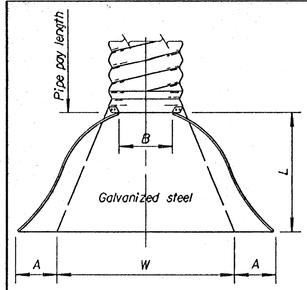
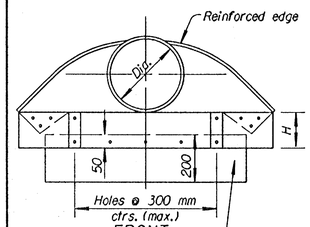
FHWA REGION NO.	STATE	PROJECT NO.	YEAR	SHEET NO.	TOTAL SHEETS
7	KANSAS	87 N-0230-01	2003	21	73



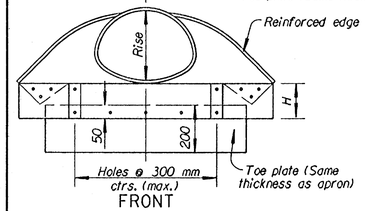
PLAN

(Illustrated with Type #3 Connection)

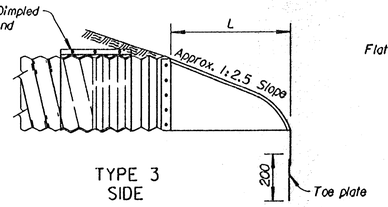


FRONT

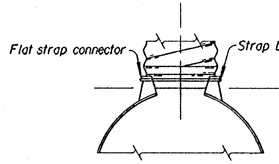
Toe plate (Same thickness as apron)



FRONT

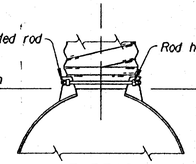


TYPE 3
SIDE



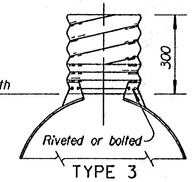
TYPE 1

Available in sizes 300 mm through 600 mm only.



TYPE 2

Available in sizes 750 mm and 900 mm round and 430 mm x 330 mm through 1 440 mm x 970 mm pipe arches.



TYPE 3

Available in sizes 1 050 mm through 2 400 mm round and 1 520 mm x 1 170 mm through 2 050 mm x 1 500 mm pipe arches.

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

GENERAL NOTES

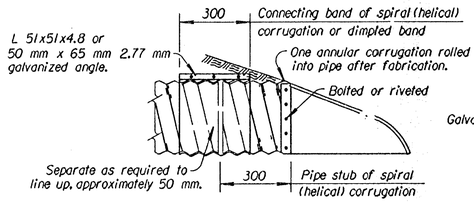
Toe plate, where specified, shall be punched to match holes in apron lip. 10 mm dia. galvanized bolts shall be

W + 255 mm for 300 mm through 750 mm diameter pipes.
W + 510 mm for 900 mm through 2 100 mm diameter pipes.
W + 255 mm for pipe arches with a rise of 330 mm through 740 mm.
W + 510 mm for pipe arches with a rise of 840 mm through 1 500 mm.

Apron section for 300 mm through 600 mm diameter pipe and pipe arches with rise of 330 mm through 610 mm shall be made from one sheet. Apron sections for 750 mm through 1 050 mm diameter pipe and pipe arches with rise of 740 mm through 840 mm may be made from up to two sheets joined by riveting or bolting on the centerline apron section. Apron section for 1 200 mm through 1 800 mm diameter pipe and pipe arches with rise of 970 mm through 1 620 mm may be made from up to three sheets joined by riveting or bolting at equal distances from centerline. Apron sections for 1 950 mm diameter pipe and above and pipe arches with rise 1 720 mm and above may be made from up to four sheets joined by riveting or bolting.

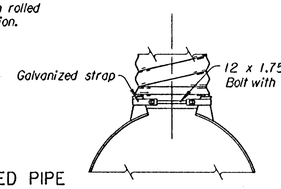
Corner sections, corner plate and toe plate shall be same thickness as apron and each shall be galvanized in accordance with the specifications.

Other approved designs may be used in lieu of type shown.



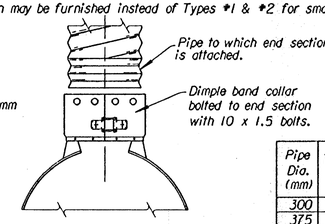
CONNECTION FOR SPIRAL (HELICAL) CORRUGATED PIPE

For all sizes of round and arch culvert pipes having spiral (helical) corrugations, the end sections and connecting bands shall be as shown above.



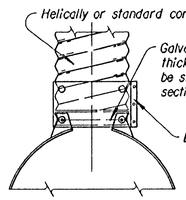
ALTERNATE TYPE 1

For 300 mm through 600 mm only.



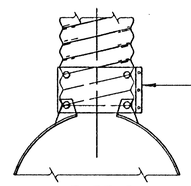
TYPE 5

Available for all round and equivalent pipe arch sizes. (Type 1 and Type 2 connections are recommended for the smaller sizes with annular ends).



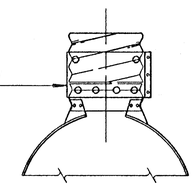
ALTERNATE TYPE D CONNECTION with Sizing Ring

Available in sizes 300 mm through 900 mm and 430 mm x 330 mm through 1 440 mm x 970 mm pipe arches.



TYPE D

Available in sizes 300 mm through 900 mm and 430 mm x 330 mm through 1 440 mm x 970 mm pipe arches.

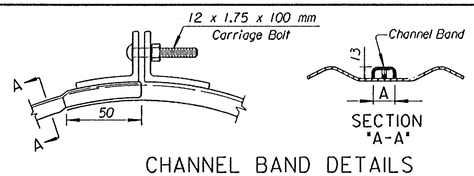


ALTERNATE TYPE 3

Avail. in sizes 1 050 mm through 2 400 mm round and 1 520 mm x 1 170 mm through 2 050 mm x 1 500 mm pipe arches.

Pipe Dia. (mm)	Min. Thickness End Sect.	Dimensions (mm) A 25 mm Tol.	B Max.	H 25 mm Tol.	L 50 mm Tol.	W 50 mm Tol.	No. Apron Panels	Slope
300	1.63	150	150	150	525	600	1	1:2.5
375	1.63	175	200	150	650	750	1	1:2.5
450	1.63	200	250	150	775	900	1	1:2.5
525	1.63	225	300	150	900	1 050	1	1:2.5
600	1.63	250	325	150	1 050	1 200	1	1:2.5
750	2.01	300	400	200	1 300	1 500	1	1:2.5
900	2.01	350	475	225	1 500	1 800	2	1:2.5
1 050	2.77	400	550	275	1 750	2 100	2	1:2.5
1 200	2.77	450	675	300	1 950	2 250	2	1:2.25
1 350	2.77	450	750	300	2 100	2 600	2	1:2.25
1 500	2.77	450	850	300	2 200	2 900	3	1:2
1 650	2.77	450	900	300	2 200	3 050	3	1:2
1 800	2.77	450	1 000	300	2 200	3 200	3	1:2
1 950	2.77	450	1 050	300	2 200	3 350	3	1:1.5
2 100	2.77	450	1 150	300	2 200	3 500	3	1:1.5
2 250	2.77	450 or 600	950 or 1 150	275 or 300	2 200	3 500 or 3 650	3	1:1.5
2 400	2.77	450 or 625	900 or 1 150	300	2 200	3 500 or 3 800	3	1:1.5

Bid Designation m^2	Nom. W.W. Area m^2	Pipe Arch Span (mm)	Rise (mm)	Min. Thickness End Sect.	Dimensions (mm) A 25 mm Tol.	B Max.	H 25 mm Tol.	L 50 mm Tol.	W 50 mm Tol.	No. Apron Panels	Slope
0.10	0.10	430	330	1.63	175	225	150	475	750	1	1:2.5
0.15	0.15	530	380	1.63	175	250	150	575	900	1	1:2.5
0.20	0.20	610	460	1.63	200	300	150	700	1 050	1	1:2.5
0.25	0.26	710	510	1.63	225	350	150	800	1 200	1	1:2.5
0.30 or 0.35	0.41	885	610	2.01	250	400	150 or 200	1 000	1 525	1	1:2.5
0.45 or 0.55	0.59	1 060	740	2.01	300	450	200 or 225	1 175	1 900	2	1:2.5
0.65 or 0.80	0.81	1 240	840	2.77	325	525	225 or 300	1 350	2 175	2	1:2.5
0.90 or 1.00	1.06	1 440	970	2.77	450	650	300	1 600	2 250	2	1:2.5
1.15 or 1.30	1.45	1 520	1 170	2.77	450	875	300	1 775	2 600	2	1:2
1.55	1.79	1 670	1 300	2.77	450	850	300	1 950	2 900 or 2 950	3	1:1.5
2.00	2.16	1 850	1 400	2.77	450	900	300	1 950	3 200	3	1:1.5
2.30	2.55	2 050	1 500	2.77	450	1 000	300	1 950	3 500	3	1:1.5
3.00	2.99	2 200	1 620	2.77	550	975	300	1 950	3 750	3	1:1.5
3.40	3.44	2 400	1 720	2.77	550	875	300	1 950	4 125	3	1:1.5
3.90	3.94	2 600	1 820	2.77	550	975	300	1 950	4 425	3	1:1.5
4.40	4.46	2 840	1 920	2.77	600	1 025	300	1 950	4 425	3	1:1.5

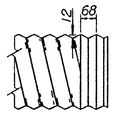


SECTION "A-A"

CHANNEL BAND DETAILS

Channel band couplers shall:

1. Be of two piece design.
2. Be fabricated f · m galvanized steel.
3. Be 2.01 mm thickness for pipe 2.77 mm or thinner. (A= 19 mm)
4. Be 2.77 mm thickness for pipe 3.51 mm or thicker. (A= 25 mm)
5. Have L 51 mm x 51 mm x 4.8 mm securely fastened to each band end to allow for proper tightening.



DETAIL OF 68 mm x 12 mm REFORMED END

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

Pipe Dia. mm	*Min. Thickness of Pipe (mm) 68x12 Corr. Steel	75x25 Corr.▲ Steel	152x51 Corr. Steel	
300	1.63			
375	1.63			
450	1.63			
525	1.63			
600	2.01			
750	2.01			
900	2.01			
1 050	2.77	2.01		
1 200	2.77	2.01		
1 350	2.77	2.01		
1 500	3.51	2.01	2.77	
1 650	3.51	2.01	2.77	
1 800	3.51	2.01	2.77	
1 950	4.27	2.01	2.77	
2 100		2.77	2.77	
2 250		2.77	2.77	
2 400		2.77	2.77	
2 550		2.77	2.77	
2 700		3.51	2.77	
2 850		3.51	2.77	
3 000		3.51	2.77	

Bid Designation m^2	Pipe Dimension Span & Rise (mm)	End Area m^2	*Min. Thickness of Pipe 68x 12 Corr. Steel	75x 25 Corr.▲ Steel	
0.10	430 x 330	0.10	1.63		
0.15	530 x 380	0.15	1.63		
0.20	610 x 460	0.20	1.63		
0.25	710 x 510	0.26	2.01		
0.30 or 0.35	885 x 610	0.41	2.01		
0.45 or 0.55	1 060 x 740	0.59	2.01		
0.65 or 0.80	1 240 x 840	0.81	2.77		
0.90 or 1.00	1 440 x 970	1.06	2.77		
1.15 or 1.30	1 520 x 1 170	1.45		2.01	
1.55	1 670 x 1 300	1.79		2.01	
2.00	1 850 x 1 400	2.16		2.77	
2.30	2 050 x 1 500	2.55		2.77	
3.00	2 200 x 1 620	2.99		2.77	
3.40	2 400 x 1 720	3.44		2.77	
3.90	2 600 x 1 820	3.94		2.77	
4.40	2 840 x 1 920	4.46		2.77	
5.00	2 970 x 2 020	5.04		3.51	
5.60	3 240 x 2 120	5.63		3.51	
6.25	3 470 x 2 220	6.27		3.51	
6.90	3 600 x 2 320	6.93		3.51	

▲ Note: At the Contractor's option, 125 mm x 25 mm corrugated steel pipe of equal thickness may be substituted for the 75 mm x 25 mm corrugated steel pipe listed in the table with the following restrictions:

1. Fill height over top of pipe shall be less than 7.6 m.
2. Pipe shall be fabricated with helical corrugations and lock seams or continuous welded seams.

GENERAL NOTES

The culverts listed on this sheet may not indicate that the culvert installed will be steel, aluminum or reinforced concrete.

*For thickness above minimum requirements see summary of culverts.

Connection of end sections by welding will not be permitted.

All 3 piece apron sections shall have 2.77 mm sides and 3.51 mm 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 1 500 mm through 3 000 mm diameter pipe apron sections, reinforced edges shall be supplemented by hot dipped galvanized stiffener angles. The angles shall be attached by galvanized nuts and bolts.

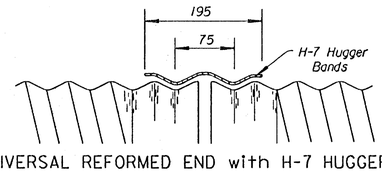
For 1 850 mm x 1 400 mm and larger pipe arch sections, reinforced edges shall be supplemented by hot dipped galvanized stiffener angles. The angles shall be attached by galvanized bolts and nuts.

Angle reinforcement shall be placed under the center panel seams on 1 850 mm x 1 400 mm and larger pipe arch apron sections.

All references to galvanized metal refer to steel only.

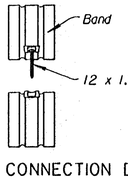
Gain in pipe length due to fit of pipe at connecting band shall not be paid for.

When Hugger Bands are used the H-7 Hugger Band may be used on circular pipes 900 mm diameter and smaller and pipe arches 1 060 mm x 740 mm and smaller. The H-10 Hugger Band is required for larger size pipes.

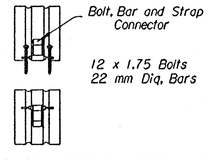


UNIVERSAL REFORMED END with H-7 HUGGER BAND

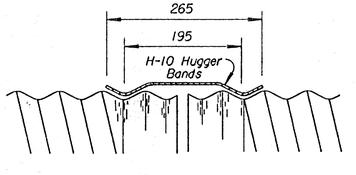
DETAILS FOR H-7 HUGGER BANDS (1.63 mm)



STANDARD CONNECTION DETAIL

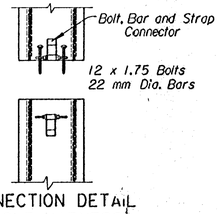


ALTERNATE CONNECTION DETAIL

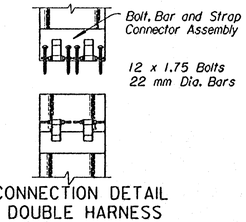


UNIVERSAL REFORMED END with H-10 HUGGER BAND

DETAILS FOR H-10 HUGGER BANDS (1.63 mm)



CONNECTION DETAIL SINGLE HARNESS



CONNECTION DETAIL DOUBLE HARNESS

PIPE CULVERT SUMMARY

Station	Location	Type	Dia. or Bid Designation	Crown Grade Elev.	Flow Line Lt.	Flow Line Rt.	Horizontal Roadway Lt.	Horizontal Roadway Rt.	Degree of Rotation	Length of Pipe (m) Lt.	Length of Pipe (m) Rt.	Total Length (m)	End Sections Type I Lt.	Type I Rt.	Type III Lt.	Type III Rt.	Type IV Lt.	Type IV Rt.
1+775	Lt.	E.P.	375 mm	—	—	—	—	—	—	—	—	12.2	1	1				
1+965	Lt.	E.P.	375 mm	—	—	—	—	—	—	—	—	9.1						

NO.	DATE	REVISIONS	BY	APP'D
4	10-03-00	Revised bolt callouts	R.J.S.	J.O.B.
3	4-27-98	Added pipe corrugation option note	R.J.S.	J.O.B.
2	1-12-96	Rev. Arch Dimensions	R.J.S.	J.O.B.
1	7-24-95	Rev. General Notes, tables & details	R.J.S.	J.O.B.

KANSAS DEPARTMENT OF TRANSPORTATION

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

RD710 S1

FHWA APPROVAL	10-13-00	APP'D. James O. Brewer	
DESIGNED	DETAILED	QUANTITIES	TRACED Bowser
DESIGN CK.	DETAIL CK.	QUAN.CK.	TRACE CK. Seltz

Drawn By :untitled | Plotted :4/28/2004
File : JN0251/DWGS/RD710S1x.dgn