

LANE ...

THE FINEST IN STRUCTURAL PLATE



Structural Plate Pipe 22 feet in diameter, Elongated Railroad Tunnel

STRUCTURAL PLATE TECHNICAL GUIDE

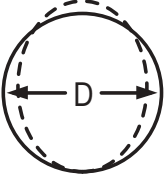
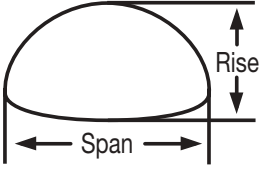
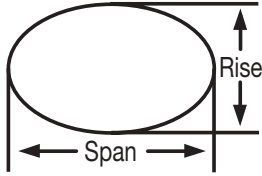
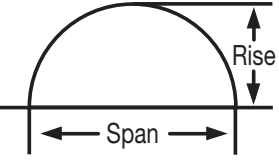
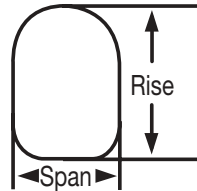
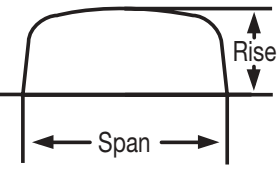


Drain with Lane

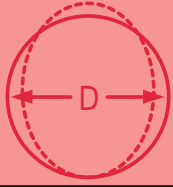
Lane engineers, manufactures and can erect corrugated steel, structural plate products in six basic shapes: pipe, pipe arches, horizontal ellipses, arches, underpasses and box culverts. They are used in a variety of installations such as storm drainage, culverts, stream enclosures, underpasses, conveyor covers, tunnels, mine overcasts and retention/detention systems. They are also used as vehicle, animal and pedestrian underpasses. Our modern facilities include the latest equipment and the most modern production techniques.

LANE STRUCTURAL PLATE PRODUCTS AT A GLANCE

Lane Structural Plate Products

Shape	Page	Range of Sizes	Common Uses
Structural Plate Pipe — Round 	1-3	5' to 26' (1500mm to 8010mm)	Culverts, subdrains, sewers, service tunnels, etc. All plates same radius. For medium and high fills (or trenches). For appearance and where backfill compaction is only moderate, 5% vertically elongated is available.
Pipe Arch 	4-11	6'1" x 4'7" to 20'7" x 13'2" (1850mm x 1400mm to 6270mm x 4010mm)	Perfect for economical bridges, where headroom is limited. Has hydraulic advantages at low flows. Corner plate radius, 18" or 31".
Horizontal Ellipse 	12-15	7'4" x 5'6" to 14'11" x 11'2" (2240mm x 1680mm to 4550mm x 3400mm)	Culverts, grade separations, storm sewers, tunnels.
Arch 	16-19	Span x Rise 5' x 1'9 1/2" to 26' x 13' (1520mm x 550mm to 7920mm x 3960mm)	For low-clearance large waterway openings and aesthetics.
Underpass 	20-23	Span x Rise 5'8" x 5'9" to 20'4" x 17'9" (1730mm x 1750mm to 6200mm x 5410mm)	For pedestrians, livestock, golf carts or vehicles.
Low Profile Box Culverts 	24-26	9'8" x 2'7" to 20'9" x 10'2" (2950mm x 790mm to 6320mm x 3100mm)	Low-wide waterway enclosures, culverts, storm sewers.
Product Details and Specifications	26-29		

PIPE



Can be used for culverts, subdrains, sewers and service tunnels. All plates are the same radius, for medium and high fills (or trenches). For appearance and where backfill compaction is only moderate, 5% vertical ellipse is available.

Lane Structural Plate Pipe Sizes, Plate Requirements and Weights 12, 10, 8, 7 thru 1 Gage

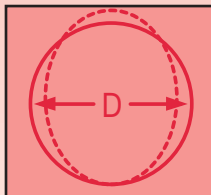
Ft.	Nominal Diameter Inch	Waterway Area Sq. Ft.	"N" in Ring	Number of Plates To Form Ring			Approximate Weight In Pounds Per Foot								
				5N	6N	7N	0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)		
5	60	1500	20	20	4				105	132	160	178	205	233	260
5-1/2	66	1655	24	22	2	2			116	145	176	195	226	256	286
6	72	1810	28	24		4			126	158	192	213	246	279	312
6-1/2	78	1965	33	26		2	2		137	172	207	231	267	303	339
7	84	2120	38	28			4		147	185	223	249	287	326	365
7-1/2	90	2275	44	30	6				158	198	239	266	308	349	391
8	96	2430	50	32	4	2			168	211	255	284	328	372	417
8-1/2	102	2585	57	34	2	4			179	224	271	302	349	396	443
9	108	2740	64	36	2	2	2		189	238	287	320	369	419	469
9-1/2	114	2895	71	38		4	2		200	251	303	337	390	442	495
10	120	3050	79	40		2	4		210	264	319	355	410	466	521
10-1/2	126	3205	87	42			6		221	277	335	373	431	489	547
11	132	3360	95	44	6		2		231	290	351	391	451	512	573
11-1/2	138	3515	104	46	4	2	2		242	307	367	408	472	535	599
12	144	3670	113	48	2	4	2		252	317	383	426	492	559	625
12-1/2	150	3825	123	50	2	2	4		263	330	399	444	513	582	651
13	156	3980	133	52		4	4		273	343	415	462	534	605	677
13-1/2	162	4135	143	54		2	6		284	356	431	480	554	629	703
14	168	4290	154	56			8		294	370	447	497	575	652	729
14-1/2	174	4445	165	58	6		4		305	383	463	515	595	675	755
15	180	4600	177	60	4	2	4		315	396	479	533	616	698	781
15-1/2	186	4755	189	62	2	4	4		326	409	495	551	636	722	807
16	192	4910	201	64		6	4		336	422	511	568	657	745	833
16-1/2	198	5065	214	66		4	6			436	527	586	677	768	859
17	204	5220	227	68			2	8		449	543	604	698	792	885
17-1/2	210	5375	241	70				10		462	559	622	718	815	911
18	216	5530	254	72	4	4	4			475	575	639	739	838	937
18-1/2	222	5685	269	74	2	6	4				591	657	759	861	963
19	228	5840	284	76	2	4	6				606	675	780	885	990
19-1/2	234	5995	299	78		6	6				622	693	800	908	1016
20	240	6150	314	80		4	8				638	710	821	931	1042
20-1/2	246	6305	330	82		2	10					728	841	954	1068
21	252	6460	346	84				12				746	862	978	1094
21-1/2	258	6615	363	86	4	4	6						882	1001	1120
22	264	6770	380	88	2	6	6						903	1024	1146
22-1/2	270	6925	398	90		8	6						923	1048	1172
23	276	7080	415	92		6	8						944	1071	1198
23-1/2	282	7235	434	94		4	10							1094	1224
24	288	7390	452	96		2	12							1117	1250
24-1/2	294	7545	470	98			14							1141	1276
25	300	7700	491	100	4	4	8							1164	1302
25-1/2	306	7855	510	102	2	6	8							1187	1328
26	312	8010	530	104		8	8							1211	1354

Height-of-Cover Limits for Structural Plate Pipe H20 or H25 Live Load 6 x 2 in. Corrugation

Ft.	Diameter or Span Inch	mm	Minimum* Cover in.	Maximum Cover, ft. Specified Thickness, in.						
				0.111	0.140	0.170	0.188	0.218	0.249	0.280
5	60	1500	12	81	120	157	176	205	234	264
5-1/2	66	1655	12	74	110	143	159	186	213	240
6	72	1810	12	68	101	131	146	171	195	220
6-1/2	78	1965	12	62	92	121	135	157	180	203
7	84	2120	12	58	86	112	125	146	168	188
7-1/2	90	2275	12	54	80	105	117	137	156	176
8	96	2430	12	51	75	98	111	128	146	165
8-1/2	102	2585	18	48	71	92	103	120	137	155
9	108	2740	18	45	67	87	97	114	130	146
9-1/2	114	2895	18	43	63	82	92	108	123	139
10	120	3050	18	40	60	78	87	102	117	132
10-1/2	126	3205	18	39	57	74	83	97	112	126
11	132	3360	18	37	54	71	79	93	106	120
11-1/2	138	3515	18	35	52	68	76	89	102	114
12	144	3670	18	34	50	65	73	85	97	110
12-1/2	150	3825	24	32	48	63	70	82	93	106
13	156	3980	24	31	46	60	67	79	90	101
13-1/2	162	4135	24	30	44	58	65	76	87	98
14	168	4290	24	29	43	56	62	73	83	94
14-1/2	174	4445	24	28	41	54	60	70	80	91
15	180	4600	24	27	40	52	58	68	78	88
15-1/2	186	4755	24	26	39	50	56	66	75	85
16	192	4910	24	25	37	49	54	64	73	82
16-1/2	198	5065	30		36	47	53	62	71	80
17	204	5220	30		35	45	51	60	68	77
17-1/2	210	5375	30		34	43	49	57	65	74
18	216	5530	30		33	42	47	55	63	71
18-1/2	222	5685	30			40	45	52	60	68
19	228	5840	30			38	43	50	58	65
19-1/2	234	5995	30			37	41	48	55	62
20	240	6150	30			35	40	47	53	60
20-1/2	246	6305	36				38	45	51	57
21	252	6460	36				36	43	49	56
21-1/2	258	6615	36					41	47	53
22	264	6770	36					39	45	51
22-1/2	270	6925	36					38	43	49
23	276	7080	36					36	41	46
23-1/2	282	7235	36						40	45
24	288	7390	42						38	43
24-1/2	294	7545	42						36	41
25	300	7700	42							39
25-1/2	306	7855	42							37
26	312	8010	42							36

*Minimum covers are for H20 and H25 loads. Minimum covers are measured from top of pipe to bottom of flexible pavement, or top of pipe to top of rigid pavement. Minimum cover must be maintained in unpaved traffic areas.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



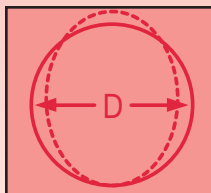
Height-of-Cover Limits for Structural Plate Pipe E80 Live Load 6 x 2 in. Corrugation

Ft.	Diameter or Span		Minimum* Cover in.	Maximum Cover, ft. Specified Thickness, in.						
	Inch	mm		0.111	0.140	0.170	0.188	0.218	0.249	0.280
5	60	1500	24	81	120	157	176	205	234	264
5-1/2	66	1655	24	74	110	143	159	186	213	240
6	72	1810	24	68	101	131	146	171	195	220
6-1/2	78	1965	24	62	92	121	135	157	180	203
7	84	2120	24	58	86	112	125	146	168	188
7-1/2	90	2275	24	54	80	105	117	137	156	176
8	96	2430	24	51	75	98	111	128	146	165
8-1/2	102	2585	24	48	71	92	103	120	137	155
9	108	2740	24	45	67	87	97	114	130	146
9-1/2	114	2895	24	43	63	82	92	108	123	139
10	120	3050	24	40	60	78	87	102	117	132
10-1/2	126	3205	30	39	57	74	83	97	112	126
11	132	3360	30	37	54	71	79	93	106	120
11-1/2	138	3515	30	35**	52	68	76	89	102	114
12	144	3670	30	34**	50	65	73	85	97	110
12-1/2	150	3825	30	32**	48	63	70	82	93	106
13	156	3980	36	31**	46	60	67	79	90	101
13-1/2	162	4135	36	30**	44	58	65	76	87	98
14	168	4290	36	29**	43	56	62	73	83	94
14-1/2	174	4445	36	28**	41	54	60	70	80	91
15	180	4600	36	26**	40	52	58	68	78	88
15-1/2	186	4755	42	25**	39	50	56	66	75	85
16	192	4910	42	24**	37	49	54	64	73	82
16-1/2	198	5065	42	23**	36	47	53	62	71	80
17	204	5220	42		35	45	51	60	68	77
17-1/2	210	5375	42		34	43	49	57	65	74
18	216	5530	48		33	42	47	55	63	71
18-1/2	222	5685	48			40	45	52	60	68
19	228	5840	48			38	43	50	58	65
19-1/2	234	5995	48			37	41	48	55	62
20	240	6150	48			35	40	47	53	60
20-1/2	246	6305	54				38	45	51	57
21	252	6460	54				36	43	49	56
21-1/2	258	6615	54					41	47	53
22	264	6770	54					39	45	51
22-1/2	270	6925	60					38	43	49
23	276	7080	60					36	41	46
23-1/2	282	7235	60						40	45
24	288	7390	60						38	43
24-1/2	294	7545	60						36	41
25	300	7700	60							39
25-1/2	306	7855	60							37
26	312	8010	60							36

*From top of pipe to bottom of tie.

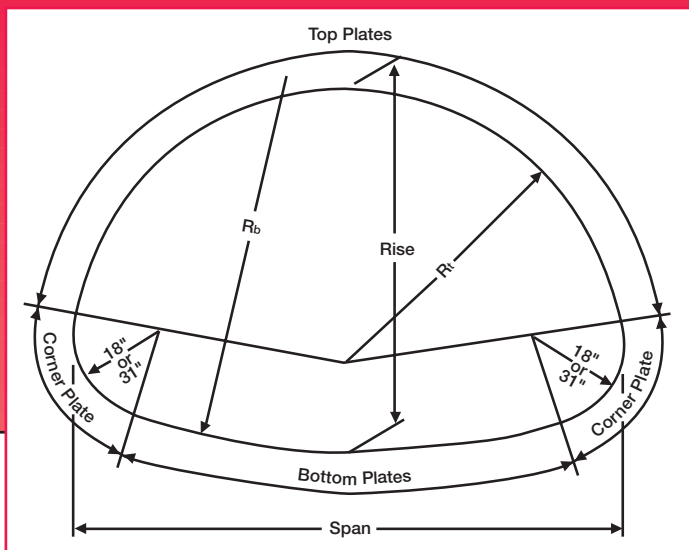
**These pipes require additional minimum cover.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



PIPE ARCH

Pipe arch is ideal for economical bridges, where headroom is limited. Has hydraulic advantages at low flows. Available in the standard sizes and shapes adopted by the industry as shown in the following tables. High loads developed at the corner plates require adequate allowable foundation pressures for satisfactory performance. Height of cover tables indicate the maximum fill related to allowable foundation pressures.



Sizes and Layout Details Lane Structural Plate Pipe Arch with 18 Inch Radius Corner Plates

Size Feet-Inch		Metric Size mm		Waterway Area Square Feet	Top	Required "N" Bottom	Total*	Inside Plate Radius**	
Span	Rise	Span	Rise					Rt (in.)	Rb (in.)
6-1	4-7	1850	1400	22	11	5	22	36.7	76.4
6-4	4-9	1930	1450	24	12	5	23	38.1	98.9
6-9	4-11	2060	1500	26	12	6	24	41.0	83.5
7-0	5-1	2130	1550	28	13	6	25	42.3	104.5
7-3	5-3	2210	1600	31	14	6	26	43.5	136.5
7-8	5-5	2340	1650	33	14	7	27	46.5	109.9
7-11	5-7	2410	1700	35	15	7	28	47.7	138.4
8-2	5-9	2490	1750	38	16	7	29	48.9	183.1
8-7	5-11	2620	1800	40	16	8	30	51.9	141.3
8-10	6-1	2690	1850	43	17	8	31	53.0	179.2
9-4	6-3	2840	1910	46	17	9	32	56.2	144.9
9-6	6-5	2900	1960	49	18	9	33	57.2	178.2
9-9	6-7	2970	2010	52	19	9	34	58.3	228.0
10-3	6-9	3120	2060	55	19	10	35	61.5	178.9
10-8	6-11	3250	2110	58	19	11	36	64.9	153.2
10-11	7-1	3330	2160	61	20	11	37	65.8	180.8
11-5	7-3	3480	2210	64	20	12	38	69.4	157.8
11-7	7-5	3530	2260	67	21	12	39	70.2	183.4
11-10	7-7	3610	2310	71	22	12	40	71.1	217.0
12-4	7-9	3760	2360	74	22	13	41	74.7	186.5
12-6	7-11	3810	2410	78	23	13	42	75.5	217.4
12-8	8-1	3860	2460	81	24	13	43	76.3	258.4
12-10	8-4	3910	2540	85	25	13	44	77.2	315.2
13-5	8-5	4090	2570	89	25	14	45	80.7	255.7
13-11	8-7	4240	2620	93	25	15	46	84.4	220.8
14-1	8-9	4290	2670	97	26	15	47	85.1	254.8
14-3	8-11	4340	2720	101	27	15	48	85.9	298.7
14-10	9-1	4520	2770	105	27	16	49	89.5	254.9
15-4	9-3	4670	2820	109	27	17	50	93.4	226.5
15-6	9-5	4720	2870	113	28	17	51	94.0	255.9
15-8	9-7	4780	2920	118	29	17	52	94.7	292.5
15-10	9-10	4830	3000	122	30	17	53	95.4	339.1
16-5	9-11	5000	3020	126	30	18	54	99.2	292.6
16-7	10-1	5050	3070	131	31	18	55	99.8	333.8

*Includes two compound curved corner/bottom plates, or corner/top plates.

**All corner plates are curved to 18" inside radius.

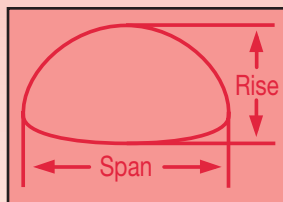
All dimensions are measured from inside crests. Tolerances must be allowed for specification purposes.

For standard plate arrangement, see following table.

Lane Structural Plate Pipe Arch with 18 Inch Radius Corner Plates Sizes, Plate Requirements and Weights 12, 10, 8, 7 thru 1 Gage

Size Feet-Inch		Metric Size mm		Waterway Area Square Feet	"N" in Ring	Number of Plates To Form Ring			Approximate Weight Per Foot of Structure, Pounds*						
Span	Rise	Span	Rise			5N	6N	7N	0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)
6-1	4-7	1850	1400	22	22	2	2		116	145	176	195	226	256	286
6-4	4-9	1930	1450	24	23	1	3		121	152	184	204	236	268	299
6-9	4-11	2060	1500	26	24		4		126	158	192	213	246	279	312
7-0	5-1	2130	1550	28	25		3	1	131	165	200	222	257	291	326
7-3	5-3	2210	1600	31	26		2	2	137	172	207	231	267	303	339
7-8	5-5	2340	1650	33	27		1	3	142	178	215	240	277	314	352
7-11	5-7	2410	1700	35	28	3	1	1	147	185	223	249	287	326	365
8-2	5-9	2490	1750	38	29	2	2	1	152	191	231	258	298	338	378
8-7	5-11	2620	1800	40	30	2	1	2	158	198	239	266	308	349	391
8-10	6-1	2690	1850	43	31	2		3	163	205	247	275	318	361	404
9-4	6-3	2840	1910	46	32	5		1	168	211	255	284	328	372	417
9-6	6-5	2900	1960	49	33	3	3		173	218	263	293	339	384	430
9-9	6-7	2970	2010	52	34	3	2	1	179	224	271	302	349	396	443
10-3	6-9	3120	2060	55	35	2	3	1	184	231	279	311	359	407	456
10-8	6-11	3250	2110	58	36	2	2	2	189	238	287	320	369	419	469
10-11	7-1	3330	2160	61	37	2	1	3	194	244	295	329	380	431	482
11-5	7-3	3480	2210	64	38		4	2	200	251	303	337	390	442	495
11-7	7-5	3530	2260	67	39		3	3	205	257	311	346	400	454	508
11-10	7-7	3610	2310	71	40	2	5		210	264	319	355	410	466	521
12-4	7-9	3760	2360	74	41	2	4	1	215	271	327	364	421	477	534
12-6	7-11	3810	2410	78	42	2	3	2	221	277	335	373	431	489	547
12-8	8-1	3860	2460	81	43	2	2	3	226	284	343	382	441	501	560
12-10	8-4	3910	2540	85	44	1	3	3	231	290	351	391	451	512	573
13-5	8-5	4090	2570	89	45	1	2	4	236	297	359	400	462	524	586
13-11	8-7	4240	2620	93	46	1	1	5	241	303	367	408	472	536	599
14-1	8-9	4290	2670	97	47		2	5	246	310	375	418	482	548	612
14-3	8-11	4340	2720	101	48		1	6	252	316	383	426	492	559	625
14-10	9-1	4520	2770	105	49	2	3	3	257	323	391	435	502	570	638
15-4	9-3	4670	2820	109	50	1	4	3	262	330	399	444	513	582	651
15-6	9-5	4720	2870	113	51	1	3	4	267	336	407	453	523	594	664
15-8	9-7	4780	2920	118	52	3	5	1	273	343	414	462	534	605	677
15-10	9-10	4830	3000	122	53	3	4	2	278	349	422	470	544	617	690
16-5	9-11	5000	3020	126	54	2	5	2	283	356	430	480	554	629	703
16-7	10-1	5050	3070	131	55	2	4	3	288	363	439	488	564	640	716

*Number of plates and plate arrangement may be changed to meet specific structural requirements.



Height-of-Cover Limits for Structural Plate Pipe Arch 18 in. Rc Corner Radius H20 or H25 Live Load

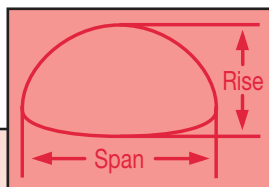
Span	Size Feet-Inch	Rise	Span	Metric Size mm	Rise	Minimum Specified Thickness Required, in.	Minimum* Cover, in.	6 x 2 in. Corrugation Maximum Cover (ft.) Over Pipe Arch for the Following Soil Corner Bearing Capacities	
								2 tons/ft ²	3 tons/ft ²
6-1		4-7	1850		1400	0.111	12	19	
6-4		4-9	1930		1450	0.111	12	18	
6-9		4-11	2060		1500	0.111	12	17	
7-0		5-1	2130		1550	0.111	12	16	
7-3		5-3	2210		1600	0.111	12	16	
7-8		5-5	2340		1650	0.111	12	15	
7-11		5-7	2410		1700	0.111	12	14	
8-2		5-9	2490		1750	0.111	18	14	
8-7		5-11	2620		1800	0.111	18	13	
8-10		6-1	2690		1850	0.111	18	13	
9-4		6-3	2840		1910	0.111	18	12	
9-6		6-5	2900		1960	0.111	18	12	
9-9		6-7	2970		2010	0.111	18	12	
10-3		6-9	3120		2060	0.111	18	10	
10-8		6-11	3250		2110	0.111	18	8	
10-11		7-1	3330		2160	0.111	18	8	
11-5		7-3	3480		2210	0.111	18	8	15
11-7		7-5	3530		2260	0.111	18	8	15
11-10		7-7	3610		2310	0.111	18	7	14
12-4		7-9	3760		2360	0.111	24	6	12
12-6		7-11	3810		2410	0.111	24	6	12
12-8		8-1	3860		2460	0.111	24	6	11
12-10		8-4	3910		2540	0.111	24	6	11
13-5		8-5	4090		2570	0.111	24	5	11
13-11		8-7	4240		2620	0.111	24	5	10
14-1		8-9	4290		2670	0.111	24	5	10
14-3		8-11	4340		2720	0.111	24	5	10
14-10		9-1	4520		2770	0.111	24	5	10
15-4		9-3	4670		2820	0.111	24		9
15-6		9-5	4720		2870	0.111	24		9
15-8		9-7	4780		2920	0.111	24		9
15-10		9-10	4830		3000	0.111	24		9
16-5		9-11	5000		3020	0.111	30		9
16-7		10-1	5050		3070	0.111	30		9

Notes:

1. Soil bearing capacity refers to the soil in the region of the pipe corner.
The remaining backfill around the pipe arch must be compacted to a specified AASHTO T-99 density of 90%.
 2. Use reasonable care in handling and installation.
 3. Pipe arches are typically used where the cover does not exceed 15 feet.
- *Minimum covers are for H20 and H25 loads. Minimum covers are measured from top of pipe to bottom of flexible pavement or top of pipe to top of rigid pavement. Minimum cover must be maintained in unpaved traffic areas.

Source – *AISI Handbook of Steel Drainage & Highway Construction Products 1994*

For these sizes, where cover limits permit, consideration should be given to using 31 inch corner radius pipe arch.



Height-of-Cover Limits for Structural Plate Pipe Arch 18 in. Rc Corner Radius E80 Live Load

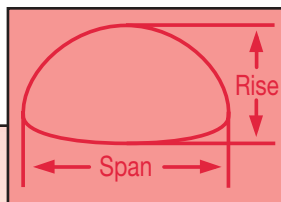
Size Feet-Inch		Metric Size mm		Minimum Specified Thickness Required, in.	Minimum* Cover, in.	6 x 2 in. Corrugation Maximum Cover (ft.) Over Pipe Arch for the Following Soil Corner Bearing Capacities		
Span	Rise	Span	Rise			2 tons/ft ²	3 tons/ft ²	4 tons/ft ²
6-1	4-7	1850	1400	0.111	24	19		
6-4	4-9	1930	1450	0.111	24	15		
6-9	4-11	2060	1500	0.111	24	15		
7-0	5-1	2130	1550	0.111	24	13		
7-3	5-3	2210	1600	0.111	24	12		
7-8	5-5	2340	1650	0.111	24	12		
7-11	5-7	2410	1700	0.111	24	11		
8-2	5-9	2490	1750	0.111	24	10		
8-7	5-11	2620	1800	0.111	24	6		
8-10	6-1	2690	1850	0.111	24	5		
9-4	6-3	2840	1910	0.111	24		17	
9-6	6-5	2900	1960	0.111	24		16	
9-9	6-7	2970	2010	0.111	24		16	
10-3	6-9	3120	2060	0.111	30		15	
10-8	6-11	3250	2110	0.111	30		13	
10-11	7-1	3330	2160	0.111	30		13	
11-5	7-3	3480	2210	0.111	30		12	
11-7	7-5	3530	2260	0.140	30		12	
11-10	7-7	3610	2310	0.140	30		12	
12-4	7-9	3760	2360	0.140	30		6	
12-6	7-11	3810	2410	0.140	30		6	16
12-8	8-1	3860	2460	0.140	36		6	16
12-10	8-4	3910	2540	0.140	36		6	16
13-5	8-5	4090	2570	0.140	36			15
13-11	8-7	4240	2620	0.140	36			15
14-1	8-9	4290	2670	0.140	36			14
14-3	8-11	4340	2720	0.140	36			11
14-10	9-1	4520	2770	0.140	36			9
15-4	9-3	4670	2820	0.140	42			9
15-6	9-5	4720	2870	0.140	42			9
15-8	9-7	4780	2920	0.140	42			9
15-10	9-10	4830	3000	0.140	42			9
16-5	9-11	5000	3020	0.140	42			7
16-7	10-1	5050	3070	0.140	42			7

Notes:

1. Soil bearing capacity refers to the soil in the region of the pipe corner.
The remaining backfill around the pipe arch must be compacted to a specified AASHTO T-99 density of 90%.
2. Use reasonable care in handling and installation.
3. Pipe arches are typically used where the cover does not exceed 15 feet.
*From top of pipe to bottom of tie.

Source – *AISS Handbook of Steel Drainage & Highway Construction Products 1994*

For these sizes, where cover limits permit, consideration should be given to using 31 inch corner radius pipe arch.



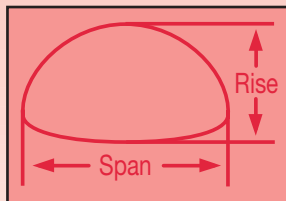
Sizes and Layout Details Lane Structural Plate Pipe Arch with 31 Inch Radius Corner Plates

Size Feet-Inch		Metric Size mm		Area Square Feet	Top	Required "N" Bottom	Total*	Inside Plate Radius**	
Span	Rise	Span	Rise					Rt (in.)	Rb (in.)
13-3	9-4	4040	2840	98	24	12	46	80.0	192.3
13-6	9-6	4110	2900	102	25	12	47	81.2	219.6
14-0	9-8	4270	2950	106	25	13	48	84.3	197.6
14-2	9-10	4320	3000	110	26	13	49	85.4	223.4
14-5	10-0	4390	3050	115	27	13	50	86.6	255.7
14-11	10-2	4550	3100	119	27	14	51	89.7	227.5
15-4	10-4	4670	3150	124	27	15	52	93.0	208.3
15-7	10-6	4750	3200	129	28	15	53	94.0	231.8
15-10	10-8	4830	3250	133	29	15	54	95.1	260.2
16-3	10-10	4950	3300	138	29	16	55	98.4	236.2
16-6	11-0	5030	3350	143	30	16	56	99.4	263.3
17-0	11-2	5180	3400	148	30	17	57	102.8	240.8
17-2	11-4	5230	3450	153	31	17	58	103.7	266.1
17-5	11-6	5310	3510	158	32	17	59	104.7	297.4
17-11	11-8	5460	3560	163	32	18	60	108.1	270.4
18-1	11-10	5510	3610	168	33	18	61	109.0	299.5
18-7	12-0	5660	3660	174	33	19	62	112.5	274.2
18-9	12-2	5720	3710	179	34	19	63	113.4	301.9
19-3	12-4	5870	3760	185	34	20	64	117.9	278.2
19-6	12-6	5940	3810	190	35	20	65	117.8	304.8
19-8	12-8	5990	3860	196	36	20	66	118.7	336.2
19-11	12-10	6070	3910	202	37	20	67	119.6	373.8
20-5	13-0	6220	3960	208	37	21	68	123.0	337.9
20-7	13-2	6270	4010	214	38	21	69	124.9	373.1

*Includes two 5N corner plates.

**All corner plates are curved to 31" inside radius.

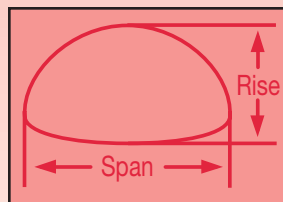
All dimensions are measured from inside crests. Tolerances must be allowed for specification purposes.
For standard plate arrangement, see following table.



Lane Structural Plate Pipe Arch with 31 Inch Radius Corner Plates Sizes, Plate Requirements and Weights 12, 10, 8, 7 thru 1 Gage

Size Feet-Inch		Metric Size mm		"N" in Ring	Number of Plates To Form Ring			Approximate Weight Per Foot of Structure, Pounds*						
Span	Rise	Span	Rise		5N	6N	7N	0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)
13-3	9-4	4040	2840	46	3	4	1	242	304	367	408	472	535	599
13-6	9-6	4110	2900	47	3	3	2	247	310	375	417	482	547	612
14-0	9-8	4270	2950	48	2	4	2	252	317	383	426	492	559	625
14-2	9-10	4320	3000	49	2	3	3	257	323	391	435	503	570	638
14-5	10-0	4390	3050	50	2	2	4	263	330	399	444	513	582	651
14-11	10-2	4550	3100	51	2	1	5	268	337	407	453	523	594	664
15-4	10-4	4670	3150	52	5	1	3	273	343	415	462	534	605	677
15-7	10-6	4750	3200	53	5		4	278	350	423	471	544	617	690
15-10	10-8	4830	3250	54	6	4		284	356	431	480	554	629	703
16-3	10-10	4950	3300	55	5	5		289	363	439	488	564	640	716
16-6	11-0	5030	3350	56	6	2	2	294	370	447	497	575	652	729
17-0	11-2	5180	3400	57	5	3	2	299	376	455	506	585	663	742
17-2	11-4	5230	3450	58	5	2	3	305	383	463	515	595	675	755
17-5	11-6	5310	3510	59	3	5	2	310	389	471	524	605	687	768
17-11	11-8	5460	3560	60	3	4	3	315	396	479	533	616	698	781
18-1	11-10	5510	3610	61	3	3	4	320	403	487	542	626	710	794
18-7	12-0	5660	3660	62	3	2	5	326	409	495	551	636	722	807
18-9	12-2	5720	3710	63	3	1	6	331	416	503	559	646	733	820
19-3	12-4	5870	3760	64	2	2	6	336	422	511	568	657	745	833
19-6	12-6	5940	3810	65	2	1	7		429	519	577	667	757	846
19-8	12-8	5990	3860	66	2	7	2		436	527	586	677	768	859
19-11	12-10	6070	3910	67	2	6	3		442	535	595	687	780	872
20-5	13-0	6220	3960	68	2	5	4		449	543	604	698	792	885
20-7	13-2	6270	4010	69	4		7		455	551	613	708	803	898

*Number of plates and plate arrangement may be changed to meet specific structural requirements.



Height-of-Cover Limits for Structural Plate Pipe Arch 31 in. Rc Corner Radius H20 or H25 Live Load

Span	Size Feet-Inch Rise	Metric Size mm	Span	Rise	Minimum Specified Thickness Required, in.	Minimum* Cover, in.	6 x 2 in. Corrugation Maximum Cover (ft.) Over Pipe Arch for the Following Soil Corner Bearing Capacities	
							2 tons/ft ²	3 tons/ft ²
13-3	9-4	4040	2840	0.111	24	13		
13-6	9-6	4110	2900	0.111	24	13		
14-0	9-8	4270	2950	0.111	24	12		
14-2	9-10	4320	3000	0.111	24	12		
14-5	10-0	4390	3050	0.111	24	12		
14-11	10-2	4550	3100	0.111	24	12		
15-4	10-4	4670	3150	0.111	24	11		
15-7	10-6	4750	3200	0.111	24	11		
15-10	10-8	4830	3250	0.111	24	10		
16-3	10-10	4950	3300	0.111	30	10		
16-6	11-0	5030	3350	0.111	30	10		
17-0	11-2	5180	3400	0.111	30	10	15	
17-2	11-4	5230	3450	0.111	30	10	15	
17-5	11-6	5310	3510	0.111	30	10	15	
17-11	11-8	5460	3560	0.111	30	10	14	
18-1	11-10	5510	3610	0.111	30	9	14	
18-7	12-0	5660	3660	0.111	30	9	14	
18-9	12-2	5720	3710	0.111	30	9	14	
19-3	12-4	5870	3760	0.111	30	9	13	
19-6	12-6	5940	3810	0.140	30	9	13	
19-8	12-8	5990	3860	0.140	30	9	13	
19-11	12-10	6070	3910	0.140	30	9	13	
20-5	13-0	6220	3960	0.140	36	8	13	
20-7	13-2	6270	4010	0.140	36	8	13	

Notes:

1. Soil bearing capacity refers to the soil in the region of the pipe corner.

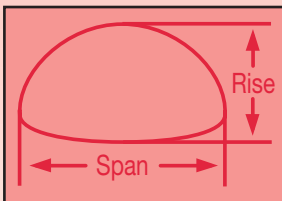
The remaining backfill around the pipe arch must be compacted to a specified AASHTO T-99 density of 90%.

2. Use reasonable care in handling and installation.

3. Pipe arches are typically used where the cover does not exceed 15 feet.

*Minimum covers are for H20 and H25 loads. Minimum covers are measured from top of pipe to bottom of flexible pavement or top of pipe to top of rigid pavement. Minimum cover must be maintained in unpaved traffic areas.

Source – *AISI Handbook of Steel Drainage & Highway Construction Products 1994*



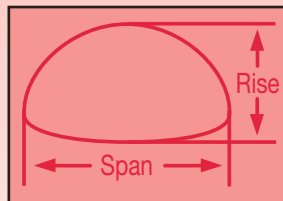
Height-of-Cover Limits for Structural Plate Pipe Arch 31 in. Rc Corner Radius E80 Live Load

Span	Size Feet-Inch	Rise	Span	Metric Size mm	Rise	Minimum Specified Thickness Required, in.	Minimum* Cover, in.	6 x 2 in. Corrugation Maximum Cover (ft.) Over Pipe Arch for the Following Soil Corner Bearing Capacities	
								2 tons/ft ²	3 tons/ft ²
13-3		9-4	4040		2840	0.140	36	9	22
13-6		9-6	4110		2900	0.140	36	8	22
14-0		9-8	4270		2950	0.140	36	6	21
14-2		9-10	4320		3000	0.140	36	6	21
14-5		10-0	4390		3050	0.140	36	6	21
14-11		10-2	4550		3100	0.140	36	6	20
15-4		10-4	4670		3150	0.140	42	6	19
15-7		10-6	4750		3200	0.140	42	6	19
15-10		10-8	4830		3250	0.140	42	6	19
16-3		10-10	4950		3300	0.140	42		14
16-6		11-0	5030		3350	0.140	42		14
17-0		11-2	5180		3400	0.140	42		13
17-2		11-4	5230		3450	0.140	42		13
17-5		11-6	5310		3510	0.140	42		13
17-11		11-8	5460		3560	0.140	48		11
18-1		11-10	5510		3610	0.140	48		11
18-7		12-0	5660		3660	0.140	48		11
18-9		12-2	5720		3710	0.140	48		11
19-3		12-4	5870		3760	0.140	48		10
19-6		12-6	5940		3810	0.170	48		10
19-8		12-8	5990		3860	0.170	48		10
19-11		12-10	6070		3910	0.170	48		10
20-5		13-0	6220		3960	0.170	48		10
20-7		13-2	6270		4010	0.170	48		10

Notes:

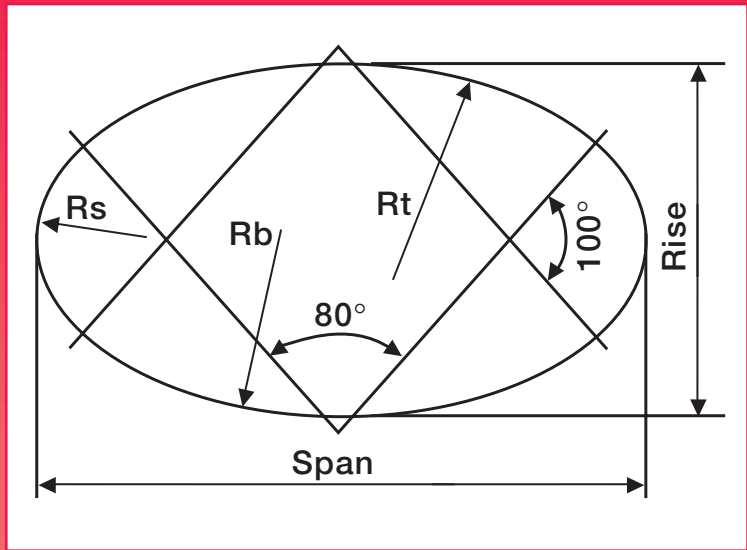
1. Soil bearing capacity refers to the soil in the region of the pipe corner.
The remaining backfill around the pipe arch must be compacted to a specified AASHTO T-99 density of 90%.
 2. Use reasonable care in handling and installation.
 3. Pipe arches are typically used where the cover does not exceed 15 feet.
- *From top of pipe to bottom of tie.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



HORIZONTAL ELLIPSE

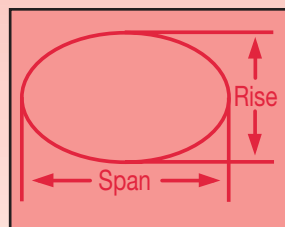
Similar to pipe arch in its common uses. However, the installation concerns associated with providing adequate corner bearing support are eliminated. Proper backfill is still important to provide proper side support.



Span	Size Feet-Inch		Metric Size mm		Waterway Area Square Feet	Required "N"		Total "N"	Inside Radii Inches	
	Span	Rise	Span	Rise		Top or Bottom	Side		Rb or Rt	Rs
7-4	5-6	2240	1680	31.3	8	5	26	54	26	
8-1	5-9	2460	1750	36.4	9	5	28	61	26	
8-10	6-0	2690	1830	41.4	10	5	30	68	26	
9-2	6-9	2790	2060	48.2	10	6	32	68	32	
9-7	6-4	2920	1930	46.7	11	5	32	75	24	
9-11	7-0	3020	2130	54.0	11	6	34	75	32	
10-4	6-7	3150	2010	52.2	12	5	34	82	24	
10-8	7-3	3250	2210	60.1	12	6	36	82	32	
11-0	8-0	3350	2440	68.2	12	7	38	82	38	
11-1	6-10	3380	2080	58.1	13	5	36	88	26	
11-4	7-6	3450	2290	66.4	13	6	38	88	32	
11-8	8-3	3560	2510	75.1	13	7	40	88	38	
12-0	8-11	3660	2720	84.1	13	8	42	88	43	
11-9	7-1	3580	2160	64.2	14	5	38	95	26	
12-1	7-10	3680	2390	73.0	14	6	40	95	32	
12-5	8-6	3780	2590	82.2	14	7	42	95	38	
12-9	9-2	3890	2760	91.7	14	8	44	95	43	
12-6	7-4	3810	2240	70.5	15	5	40	102	26	
12-10	8-1	3910	2460	79.9	15	6	42	102	32	
13-2	8-9	4010	2670	89.6	15	7	44	102	38	
13-6	9-6	4110	2900	99.6	15	8	46	102	43	
13-7	8-4	4140	2540	87.1	16	6	44	109	32	
13-11	9-0	4240	2740	97.3	16	7	46	109	38	
14-3	9-9	4340	2970	107.8	16	8	48	109	43	
14-7	10-5	4450	3180	118.7	16	9	50	109	49	
14-11	11-2	4550	3400	129.9	16	10	52	109	54	

Plate Horizontal Ellipse Weight Chart 12, 10, 8, 7 thru 1 Gage

Size Feet-Inch		Metric Size mm		Number of Plates To Form Ring			Galvanized Weight Per Foot						
Span	Rise	Span	Rise	5N	6N	7N	0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)
7-4	5-6	2240	1680		2	2	144	178	213	234	270	306	342
8-1	5-9	2460	1750			4	154	190	228	250	289	327	366
8-10	6-0	2690	1830	6			173	213	254	279	321	364	407
9-2	6-9	2790	2060	4	2		182	225	268	295	340	385	430
9-7	6-4	2920	1930	4	2		182	225	268	295	340	385	430
9-11	7-0	3020	2130	2	4		192	237	283	311	359	406	454
10-4	6-7	3150	2010	4		2	192	237	283	311	359	406	454
10-8	7-3	3250	2210	2	2	2	202	249	398	327	377	428	478
11-0	8-0	3350	2440	2		4	211	261	312	343	396	449	502
11-1	6-10	3380	2080	2	2	2	202	249	298	327	377	428	478
11-4	7-6	3450	2290		4	2	211	261	312	343	396	449	502
11-8	8-3	3560	2510		2	4	211	261	312	343	396	449	502
12-0	8-11	3660	2720	6	2		240	296	353	388	447	507	566
11-9	7-1	3580	2160	2		4	211	261	312	343	396	449	502
12-1	7-10	3680	2390		2	4	221	273	327	359	414	470	525
12-5	8-6	3780	2590			6	231	285	341	375	433	491	549
12-9	9-2	3890	2790	4	4		250	308	368	404	466	528	590
12-6	7-4	3810	2240	8			221	273	327	359	414	470	525
12-10	8-1	3910	2460	6	2		240	296	353	388	447	507	566
13-2	8-9	4010	2670	6		2	250	308	368	404	466	528	590
13-6	9-6	4110	2900	2	6		259	320	382	420	484	549	613
13-7	8-4	4140	2540	4	4		250	308	368	404	466	528	590
13-11	9-0	4240	2740	4	2	2	259	320	382	420	484	549	613
14-3	9-9	4340	2970		8		269	332	397	436	503	570	637
14-7	10-5	4450	3180		6	2	279	344	411	452	521	591	661
14-11	11-2	4550	3400		4	4	288	356	426	468	540	612	685

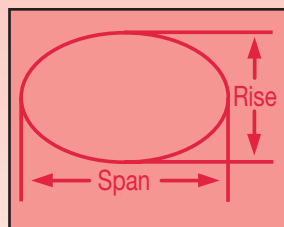


Height-of-Cover Limits for Structural Plate Horizontal Elliptical Pipe H20 or H25 Live Load 6 x 2 in. Corrugation

Span	Size Feet-Inch		Metric Size mm		Rt in.	Rs in.	Minimum* Cover in.	Minimum Specified Thickness Required, in.	Maximum Cover (ft.) Over Pipe for Side Haunch Soil Bearing and Capacity of 2 tons/ft ²
	Span	Rise	Span	Rise					
7-4	5-6	2240	1680	54.00	26.50	12	0.111	16	
8-1	5-9	2460	1750	60.88	26.50	18	0.111	14	
8-10	6-0	2690	1830	67.75	26.50	18	0.111	13	
9-2	6-9	2790	2060	67.75	32.00	18	0.111	15	
9-7	6-4	2920	1930	74.63	26.50	18	0.111	11	
9-11	7-0	3020	2130	74.63	32.00	18	0.111	14	
10-4	6-7	3150	2010	81.51	26.50	18	0.111	10	
10-8	7-3	3250	2210	81.51	32.00	18	0.111	13	
11-0	8-0	3350	2440	81.51	37.50	18	0.111	15	
11-1	6-10	3380	2080	88.38	26.50	18	0.111	10	
11-4	7-6	3450	2290	88.38	32.00	18	0.111	12	
11-8	8-3	3560	2510	88.38	37.50	18	0.111	14	
12-0	8-11	3660	2720	88.38	43.00	24	0.111	16	
11-9	7-1	3580	2160	95.26	26.50	18	0.111	9	
12-1	7-10	3680	2390	95.26	32.00	24	0.111	11	
12-5	8-6	3780	2590	95.26	37.50	24	0.111	13	
12-9	9-2	3890	2790	95.26	43.00	24	0.111	15	
12-6	7-4	3810	2240	102.13	26.50	24	0.111	8	
12-10	8-1	3910	2460	102.13	32.00	24	0.111	10	
13-2	8-9	4010	2670	102.13	37.50	24	0.111	12	
13-6	9-6	4110	2900	102.13	43.00	24	0.111	14	
13-7	8-4	4140	2540	109.01	32.00	24	0.111	9	
13-11	9-0	4240	2740	109.01	37.50	24	0.111	11	
14-3	9-9	4340	2970	109.01	43.00	24	0.111	13	
14-7	10-5	4450	3180	109.01	48.50	24	0.111	14	
14-11	11-2	4550	3400	109.01	54.00	24	0.111	16	

- Notes:
1. Soil bearing capacity refers to the soil in the region of the pipe haunches.
The remaining backfill around the ellipse must be compacted to a specified AASHTO T-99 density of 90%.
 2. Use reasonable care in handling and installation.
- *Minimum covers are for H20 and H25 loads. Minimum covers are measured from top of pipe to bottom of flexible pavement, or top of pipe to top of rigid pavement. Minimum cover must be maintained in unpaved traffic areas.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



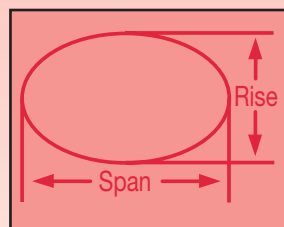
Height-of-Cover Limits for Structural Plate Horizontal Elliptical Pipe E80 Live Load 6 x 2 in. Corrugation

Span	Size Feet-Inch		Metric Size mm		Rt in.	Rs in.	Minimum* Cover in.	Minimum Specified Thickness Required, in.	Maximum Cover (ft.) Over Pipe for Side and Haunch Soil Bearing Capacity of 3 tons/ft ²
	Span	Rise	Span	Rise					
7-4	5-6	2240	1680	54.00	26.50	24	0.111	24	
8-1	5-9	2460	1750	60.88	26.50	24	0.111	21	
8-10	6-0	2690	1830	67.75	26.50	24	0.140	19	
9-2	6-9	2790	2060	67.75	32.00	24	0.140	24	
9-7	6-4	2920	1930	74.63	26.50	24	0.140	17	
9-11	7-0	3020	2130	74.63	32.00	30	0.140	21	
10-4	6-7	3150	2010	81.51	26.50	30	0.140	15	
10-8	7-3	3250	2210	81.51	32.00	30	0.140	20	
11-0	8-0	3350	2440	81.51	37.50	30	0.140	23	
11-4	7-6	3450	2290	88.38	32.00	30	0.140	18	
11-8	8-3	3560	2510	88.38	37.50	30	0.140	22	
12-0	8-11	3660	2720	88.38	43.00	30	0.140	25	
12-1	7-10	3680	2390	95.26	32.00	30	0.140	16	
12-5	8-6	3780	2590	95.26	37.50	30	0.140	20	
12-9	9-2	3890	2790	95.26	43.00	36	0.140	23	
12-10	8-1	3910	2460	102.13	32.00	36	0.170	15	
13-2	8-9	4010	2670	102.13	37.50	36	0.170	19	
13-6	9-6	4110	2900	102.13	43.00	36	0.170	22	
13-7	8-4	4140	2540	109.01	32.00	36	0.170	13	
13-11	9-0	4240	2740	109.01	37.50	36	0.170	17	
14-3	9-9	4340	2970	109.01	43.00	36	0.170	20	
14-7	10-5	4450	3180	109.01	48.50	36	0.170	23	
14-11	11-2	4550	3400	109.01	54.00	42	0.170	26	

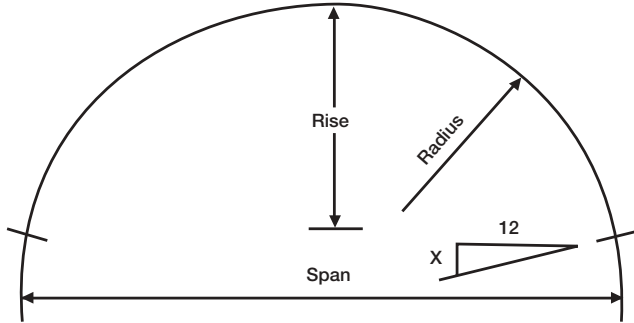
Notes:

1. Soil bearing capacity refers to the soil in the region of the pipe haunches.
The backfill around the ellipse must be compacted to a specified AASHTO T-99 density of 90%.
 2. Use reasonable care in handling and installation.
- *From top of pipe to bottom of tie.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



Lane Structural Plate Arches Standard Sizes

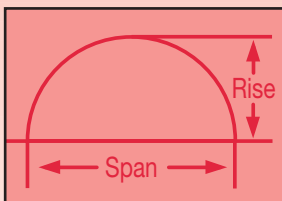


Produced in standard spans with rise to span (R/S) ratios of 0.30 to 0.50. Special sizes can be computed to meet requirements not satisfied with standard structures. Common uses include low-clearance, large waterway openings and aesthetics.

Size	Metric		Area	N	R/S	Radius	x
	Feet-Inch	mm					
5-0	2-7-1/2	1520	800	10-1/2	10	H.C.	0
	2-2-1/2		670	8-1/2	9	.45	30
	1-9-1/2		550	6-1/2	8	.36	31-1/2
6-0	3-1-1/2	1830	950	15	12	H.C.	0
	2-9		840	12-1/2	11	.46	36
	2-4		710	10	10	.39	37
	1-10		560	7-1/2	9	.30	40-1/2
7-0	3-8	2130	1120	20	14	H.C.	0
	3-3		990	17-1/2	13	.46	42
	2-10		860	15	12	.40	43
	2-4-1/2		720	12	11	.34	45
8-0	4-2	2440	1270	26-1/2	16	H.C.	0
	3-9		1140	23-1/2	15	.47	48
	3-4		1020	20	14	.42	49
	2-11		890	17	13	.36	50-1/2
	2-5		740	13-1/2	12	.30	54-1/2
9-0	4-8	2740	1420	33-1/2	18	H.C.	0
	4-3-1/2		1310	30	17	.48	54
	3-10-1/2		1180	26-1/2	16	.43	54-1/2
	3-5		1040	23	15	.38	56
	2-11-1/2		900	19	14	.33	59
10-0	5-2-1/2	3050	1590	41	20	H.C.	0
	4-9-1/2		1460	37	19	.48	60
	4-4-1/2		1330	33-1/2	18	.44	60-1/2
	3-11-1/2		1210	29-1/2	17	.39	61-1/2
	3-5-1/2		1050	25-1/2	16	.35	64
	2-11-1/2		900	21	15	.30	68-1/2
11-0	5-8-1/2	3350	1740	49-1/2	22	H.C.	0
	5-3-1/2		1610	45-1/2	21	.48	66
	4-11		1500	41	20	.45	66-1/2
	4-5-1/2		1360	37	19	.41	67-1/2
	4-0		1220	32-1/2	18	.36	69-1/2
	3-6		1070	27-1/2	17	.32	73
12-0	6-2-1/2	3660	1890	59	24	H.C.	0
	5-10		1780	54-1/2	23	.49	72
	5-5		1650	49-1/2	22	.45	72-1/2
	5-0		1520	45	21	.42	73
	4-6-1/2		1380	40	20	.38	75
	4-0-1/2		1230	35	19	.34	77-1/2
13-0	6-9	3960	2060	69-1/2	26	H.C.	0
	6-4		1930	64-1/2	25	.49	78
	5-11		1800	59	24	.46	78-1/2
	5-6		1680	54	23	.42	79
	5-0-1/2		1540	49	22	.39	80-1/2
	4-7		1400	43-1/2	21	.35	83
14-0	7-3	4270	2210	80-1/2	28	H.C.	0
	6-10		2080	75	27	.49	84
	6-5-1/2		1970	69-1/2	26	.46	84-1/2
	6-0		1830	64	25	.43	85
	5-7		1700	58	24	.40	86
	5-1-1/2		1560	52-1/2	23	.37	88
	4-7-1/2		1410	46-1/2	22	.33	91-1/2
15-0	7-9	4570	2360	92-1/2	30	H.C.	0
	7-4-1/2		2250	86-1/2	29	.49	90
	6-11-1/2		2120	80-1/2	28	.46	90
	6-6-1/2		1990	74-1/2	27	.44	91
	6-1-1/2		1870	68-1/2	26	.41	92
	5-8		1730	62-1/2	25	.38	93-1/2
	5-2		1570	56	24	.34	96-1/2
	4-7-1/2		1410	50	23	.31	100-1/2

Lane Structural Plate Arches Plate Arrangement and Weights 12, 10, 8, 7 thru 1 Gage

"N" in Ring	N3	N5	N6	N7	0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)
8	1	1			42	53	64	71	82	93	104
9	1		1		47	59	72	80	92	105	117
10		2			53	66	80	89	103	116	130
11		1	1		58	73	88	98	113	128	143
12			2		63	79	96	107	123	140	156
13			1	1	68	86	104	115	133	151	169
14				2	74	92	112	124	144	163	182
15		3			79	99	120	133	154	175	195
16		2	1		84	106	128	142	164	186	208
17		2		1	89	112	136	151	174	198	221
18			3		95	119	144	160	185	210	234
19			2	1	100	125	152	169	195	221	247
20			1	2	105	132	160	178	205	233	260
21				3	110	139	168	186	215	244	273
22		2	2		116	145	176	195	226	256	286
23		2	1	1	121	152	184	204	236	268	299
24			4		126	158	192	213	246	279	312
25		5			131	165	200	222	257	291	326
26			2	2	137	172	207	231	267	303	339
27			1	3	142	178	215	240	277	314	352
28				4	147	185	223	249	287	326	365
29		1	4		152	191	231	258	298	338	378
30			5		158	198	239	266	308	349	391
31			4	1	163	205	247	275	318	361	404
32			3	2	168	211	255	284	328	372	417
33			2	3	173	218	263	293	339	384	430
34			1	4	179	224	271	302	349	396	443
35				5	184	231	279	311	359	407	456
36			6			238	287	320	369	419	469
37			5	1		244	295	329	380	431	482
38			4	2		251	303	337	390	442	495
39			3	3		257	311	346	400	454	508
40			2	4			264	319	355	410	466
41			1	5				327	364	421	477
42				6				335	373	431	489
43			6	1				343	382	441	501
44			5	2				391	451	512	573
45			4	3				400	462	524	586
46			3	4				408	472	535	599
47			2	5				417	482	547	612
48			1	6					492	559	625
49				7					503	570	638
50			6	2					507	575	644
51			5	3					516	586	655



Height-of-Cover Limits for Structural Plate Arches
H20 or H25 Live Load 6 x 2 in. Corrugation
 $\frac{\text{Rise} \geq 0.30}{\text{Span}}$

Ft.	Span	mm	Minimum* Cover, in.	Maximum Cover, ft. Specified Thickness, in.						
				0.111	0.140	0.170	0.188	0.218	0.249	0.280
5		1520	12	81	120	157	176	205	234	264
6		1830	12	68	101	131	146	171	195	220
7		2130	12	58	86	112	125	146	168	188
8		2440	12	51	75	98	111	128	146	165
9		2740	24	45	67	87	97	114	130	146
10		3050	24	40	60	78	87	102	117	132
11		3350	24	37	54	71	79	93	106	120
12		3660	24	34	50	65	73	85	97	110
13		3960	24	31	46	60	67	79	90	101
14		4270	24	29	43	56	62	73	83	94
15		4570	24	27	40	52	58	68	78	88
16		4880	24	25	37	49	54	64	73	82
17		5180	36	24	35	45	51	60	68	77
18		5490	36	23	33	42	47	55	63	71
19		5790	36	18	31	38	43	50	58	65
20		6100	36		28	35	40	47	53	60
21		6400	36		27	32	36	43	49	56
22		6710	36		21	31	33	39	45	51
23		7010	36			27	31	36	41	46
24		7320	36			21	28	33	38	43
25		7620	48				22	31	35	39
26		7920	48					24	32	35

Note: Arches with R/S less than 0.30 require special design.

*Minimum covers are for H20 and H25 loads. Minimum covers are measured from top of pipe to bottom of flexible pavement, or top of pipe to top of rigid pavement. Minimum cover must be maintained in unpaved traffic areas.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994

Height-of-Cover Limits for Structural Plate Arches
E80 Live Load 6 x 2 in. Corrugation
 $\frac{\text{Rise} \geq 0.30}{\text{Span}}$

Ft.	Span	mm	Minimum* Cover, in.	Maximum Cover, ft. Specified Thickness, in.						
				0.111	0.140	0.170	0.188	0.218	0.249	0.280
5		1520	24	81	120	157	176	205	234	264
6		1830	24	68	101	131	146	171	195	220
7		2130	24	58	86	112	125	146	168	188
8		2440	24	51	75	98	111	128	146	165
9		2740	24	45	67	87	97	114	130	146
10		3050	24	40	60	78	87	102	117	132
11		3350	30	37	54	71	79	93	106	120
12		3660	30	34**	50	65	73	85	97	110
13		3960	36	31**	46	60	67	79	90	101
14		4270	36	29**	43	56	62	73	83	94
15		4570	36	24**	40	52	58	68	78	88
16		4880	48	23**	37	49	54	64	73	82
17		5180	48	16**	35	45	51	60	68	77
18		5490	48	14**	35	42	47	55	63	71
19		5790	48	13**	31	37	43	50	58	65
20		6100	48		28	33	40	47	53	60
21		6400	60		20	31	35	43	49	56
22		6710	60		16	27	31	39	45	51
23		7010	60			21	28	35	41	46
24		7320	60			17	22	31	37	43
25		7620	60				19	24	33	39
26		7920	60					21	24	35

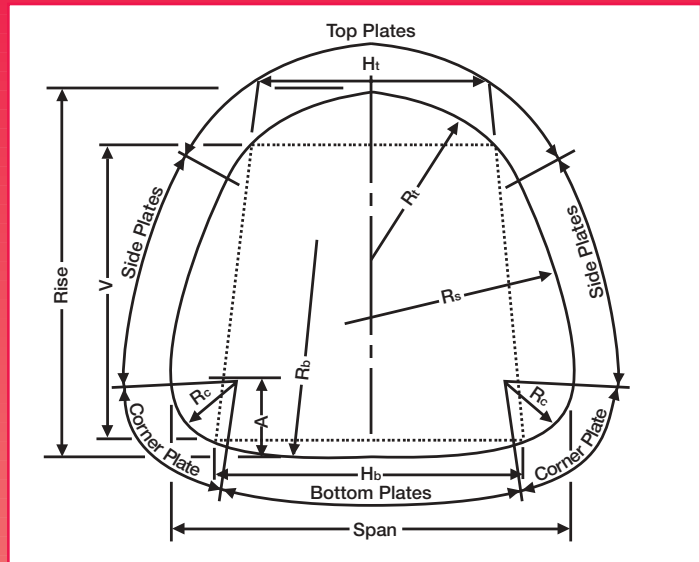
Note: Arches with R/S less than 0.30 require special design.

*From top of pipe to bottom of tie.

**These structural plate arches require additional minimum cover. Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994

UNDERPASS

As with pipe arches, corner plate pressures may control the design in many applications. The height of cover tables relate allowable foundation pressure to fill height. For detailed analysis of corner plate pressures, the designer is referred to the AISI "Handbook of Steel Drainage and Highway Construction Products." Can be used for pedestrians, livestock, golf carts or vehicles.

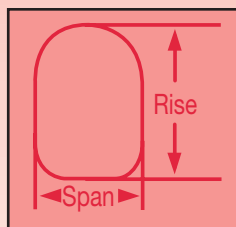


Sizes and Layout Details Lane Structural Plate Underpass (Pedestrian, Animal and Vehicle)

Size Feet-Inch		Metric Size mm		Waterway Area Square Feet		Required "N"			Total "N"	Clearance Feet-Inch			Inside Radii Inches				
Span	Rise	Span	Rise	Bottom	Corner	Side	Top	Hb		Ht	V	A Inches	Rb	Rc	Rs	Rt	
5-8	5-9	1730	1750	27	3	3	5	5	24				18	Flat	18	53	27.5
5-8	6-1	1730	1850		3	3	5	6	25				18	Flat	18	63	28.25
5-9	6-6	1750	1980	32	3	3	5	7	26				18	Flat	18	75	29.5
5-9	7-0	1750	2130	32	3	3	6	6	27				18	Flat	18	81.5	26.75
5-9	7-4	1750	2240	36	3	3	6	7	28				18	Flat	18	95.25	28.5
5-10	7-8	1780	2390	38	3	3	7	6	29				18	Flat	29	100.5	25.5
5-10	8-2	1780	2490	41	3	3	7	7	30				18	Flat	18	116.5	27.75
8-6	8-6	2590	2590	58.4	5	5	5	10	35	4-6	4-6	7-6	33	144	31	96	44
8-8	8-8	2640	2640	61.8	5	5	5	11	36	5-0	5-0	7-6	31	191	31	96	47
8-11	8-11	2720	2720	65.3	5	5	5	12	37	6-0	6-0	7-2	30	243	31	100	49
9-8	9-4	2950	2840	73.2	6	5	6	11	39	6-0	6-0	7-9	38	191	38	84	53
10-10	9-6	3300	2900	80.8	9	5	5	12	41	7-0	7-0	7-5	48	123	38	96	59
11-5	10-3	3480	3100	92.6	9	5	6	13	44	8-0	8-0	7-6	44	176	38	100	62
12-2	11-0	3710	3350	107	10	5	7	13	47	10	8	8	44	136	38	93	68
12-11	11-2	3940	3400	116	11	5	7	14	49	10	8	8-6	45	148	38	92	74
13-2	11-10	4010	3610	126	11	5	8	14	51	10	8	9-6	45	161	38	102	73
13-10	12-2	4220	3710	136	12	5	8	15	53	10	8	10	46	168	38	106	77
14-1	12-10	4290	3910	147	12	5	9	15	55	12	10	9	46	183	38	115	77
14-6	13-5	4420	4090	158	13	5	9	16	57	12	10	9-6	47	174	38	131	78
14-10	14-0	4520	4270	169	13	5	10	16	59	12	10	10-6	46	193	38	136	79
15-6	14-4	4720	4370	180	14	5	10	17	61	12	10	11	47	201	38	139	83
15-8	15-0	4780	4570	192	14	5	11	17	63	12	10	12	47	212	38	151	82
16-4	15-5	4980	4700	204	15	5	11	18	65	12	10	12-6	48	217	38	156	86
16-5	16-0	5000	4880	217	14	5	12	19	67	12	10	13	46	271	38	159	88
16-9	16-3	5110	4950	227	15	5	12	19	68	12	10	13-6	47	246	38	168	89
17-3	17-0	5260	5180	239	15	6	12	19	70	12	10	14	57	214	47	174	90
18-4	16-11	5590	5160	252	16	6	12	20	72	16	12	12	57	248	47	157	99
19-1	17-2	5820	5230	266	17	6	12	21	74	16	12	13	58	262	47	156	105
19-6	17-7	5940	5360	280	17	6	13	21	76	16	12	13-6	57	295	47	158	107
20-4	17-9	6200	5410	298	18	6	13	22	78	16	12	14	57	316	47	155	114

Structural Plate Underpass Approximate Shipping Weight and Plate Requirements

Size Feet-Inch		Metric Size mm		Number of Plates To Form Ring			Galvanized Weight Per Foot						
Span	Rise	Span	Rise	5N	6N	7N	0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)
5-8	5-9	1730	1750	1	2	1	121	152	184	204	236	268	299
5-8	6-1	1730	1850		3	1	131	165	200	222	257	291	326
5-9	6-6	1750	1980		2	2	137	172	207	231	267	303	339
5-9	7-0	1750	2130		1	3	142	178	215	240	277	314	352
5-9	7-4	1750	2240	3	1	1	147	185	223	249	287	326	365
5-10	7-8	1780	2390	2	2	1	152	191	231	258	298	338	378
5-10	8-2	1780	2490	2	1	2	158	198	239	266	308	349	391
8-6	8-6	2590	2590	7			184	231	279	311	359	407	456
8-8	8-8	2640	2640	6	1		189	238	287	320	369	419	469
8-11	8-11	2720	2720		6	1	194	244	295	329	380	431	482
9-8	9-4	2950	2840	3	4		205	257	311	346	400	454	508
10-10	9-6	3300	2900	3	2	2	215	271	327	364	421	477	534
11-5	10-2	3480	3100		5	2	231	290	351	391	451	512	573
12-2	11-0	3710	3350	4	1	3	247	310	375	417	482	547	612
12-11	11-2	3940	3400	3	1	4	257	323	391	435	503	570	638
13-2	11-10	4010	3610	3	6		268	337	407	453	523	594	664
13-10	12-2	4220	3710	2	6	1	278	350	423	471	544	617	690
14-1	12-10	4290	3910	2	4	3	289	363	439	488	564	640	716
14-6	13-5	4420	4090	2	2	5	299	376	455	506	585	663	742
14-10	14-0	4520	4270	8	2	1	310	389	471	524	605	687	768
15-6	14-4	4720	4370	8		3	320	403	487	542	626	710	794
15-8	15-0	4780	4570	6	2	3	331	416	503	559	649	733	820
16-4	15-5	4980	4700	7	5			429	519	577	667	757	846
16-5	16-0	5000	4880	2	6	3		442	535	595	687	780	872
16-9	16-3	5110	4950	5	6	1		449	543	604	698	792	885
17-3	17-0	5260	5180	3	8	1		462	559	622	718	815	911
18-4	16-11	5590	5160	2	8	2			575	639	739	838	937
19-1	17-2	5820	5230	2	6	4			591	657	759	861	963
19-6	17-7	5940	5360	2	4	6			606	675	780	885	990
20-4	17-9	6200	5410	3	7	3			622	693	800	908	1016



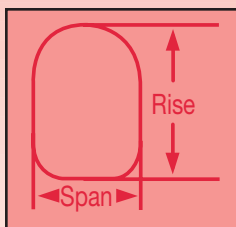
Height-of-Cover Limits for Structural Plate Underpass H20 or H25 Live Load 6 x 2 in. Corrugation

Span	Size Feet-Inch		Metric Size mm		Rc Corner Required, in.	Minimum Specified Thickness Required, in.	Minimum* Cover, in.	Maximum Cover (ft.) Over Underpass or Soil Corner Bearing Capacity of 2 tons/ft ²
	Span	Rise	Span	Rise				
5-8	5-9	1730	1750	18	0.111	12	26	
5-8	6-6	1750	1980	18	0.111	12	24	
5-9	7-4	1750	2240	18	0.111	12	24	
5-10	7-8	1780	2390	18	0.111	12	24	
5-10	8-2	1780	2490	18	0.111	12	24	
8-6	8-6	2590	2590	31	0.111	24	23	
8-8	8-8	2640	2640	31	0.111	24	22	
8-11	8-11	2720	2720	31	0.111	24	21	
9-8	9-4	2950	2840	38	0.111	24	24	
10-10	9-6	3300	2900	38	0.111	24	21	
11-5	10-2	3480	3100	38	0.111	24	20	
12-2	11-0	3710	3350	38	0.111	24	22	
12-11	11-2	3940	3400	38	0.111	24	20	
13-2	11-10	4010	3610	38	0.111	24	20	
13-10	12-2	4220	3710	38	0.111	24	19	
14-1	12-10	4290	3910	38	0.111	24	19	
14-6	13-5	4420	3910	38	0.111	24	19	
14-10	14-0	4520	4270	38	0.111	24	19	
15-6	14-4	4720	4370	38	0.111	24	15	
15-8	15-0	4780	4570	38	0.111	24	15	
16-4	15-5	4980	4700	38	0.140	36	15	
16-5	16-0	5000	4880	38	0.140	36	14	
16-9	16-3	5110	4950	38	0.140	36	14	
17-3	17-0	5260	5180	47	0.140	36	17	
18-4	16-11	5590	5160	47	0.170	36	16	
19-1	17-2	5820	5230	47	0.170	36	15	
19-6	17-7	5940	5360	47	0.170	36	15	
20-4	17-9	6200	5410	47	0.188	36	14	

Notes:

1. Soil bearing capacity refers to the soil in the region of the pipe corner.
The backfill around the pipe arch must be compacted to a specified AASHTO T-99 density of 90%.
 2. Use reasonable care in handling and installation.
- *Minimum covers are for H20 and H25 loads. Minimum covers are measured from top of pipe to bottom of flexible pavement, or top of pipe to top of rigid pavement. Minimum cover must be maintained in unpaved traffic areas.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



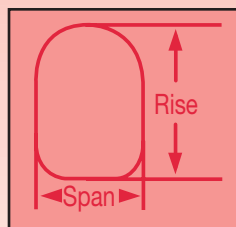
Height-of-Cover Limits for Structural Plate Underpass E80 Live Load 6 x 2 in. Corrugation

Span	Size Feet-Inch Rise	Metric Size mm Span	Metric Size mm Rise	Rc Corner Required, in.	Minimum Specified Thickness Required, in.	Minimum* Cover, in.	Maximum Cover (ft.) Over Underpass or Soil Corner Bearing Capacity of 2 tons/ft ²
5-8	5-9	1730	1750	18	0.111	24	26
5-8	6-6	1750	1980	18	0.111	24	24
5-9	7-4	1750	2240	18	0.111	24	24
5-10	7-8	1780	2390	18	0.111	24	24
5-10	8-2	1780	2490	18	0.111	24	24
8-6	8-6	2590	2590	31	0.111	24	22
8-8	8-8	2640	2640	31	0.111	24	21
8-11	8-11	2720	2720	31	0.111	24	20
9-8	9-4	2950	2840	38	0.111	24	23
10-10	9-6	3300	2900	38	0.111	36	20
11-5	10-2	3480	3100	38	0.111	36	19
12-2	11-0	3710	3350	38	0.111	36	22
12-11	11-2	3940	3400	38	0.111	36	20
13-2	11-10	4010	3610	38	0.111	36	20
13-10	12-2	4220	3710	38	0.111	36	17
14-1	12-10	4290	3910	38	0.111	36	17
14-6	13-5	4420	3910	38	0.111	36	19
14-10	14-0	4520	4270	38	0.111	36	19
15-6	14-4	4720	4370	38	0.111	48	12
15-8	15-0	4780	4570	38	0.111	48	13
16-4	15-5	4980	4700	38	0.140	48	13
16-5	16-0	5000	4880	38	0.140	48	11
16-9	16-3	5110	4950	38	0.140	48	11
17-3	17-0	5260	5180	47	0.140	48	15
18-4	16-11	5590	5160	47	0.170	48	14
19-1	17-2	5820	5230	47	0.170	48	13
19-6	17-7	5940	5360	47	0.170	48	13
20-4	17-9	6200	5410	47	0.188	48	12

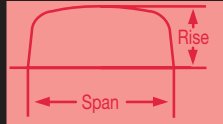
Notes:

1. Soil bearing capacity refers to the soil in the region of the pipe corner.
The backfill around the pipe arch must be compacted to a specified AASHTO T-99 density of 90%.
 2. Use reasonable care in handling and installation.
- *From top of pipe to bottom of tie.

Source – AISI Handbook of Steel Drainage & Highway Construction Products 1994



LOW PROFILE BOX CULVERT



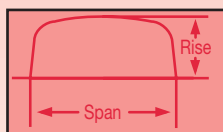
Ideal for fast, economical bridge replacement where low headroom presents a problem. The box culvert is a corrugated steel plate bridge, designed to meet AASHTO Bridge Design Standards. Fabricated from standard structural plate sections, it attains a low rise-to-span ratio through the use of reinforcing ribs bolted at regular intervals along the crown and sides of the structure. The design has been verified through extensive full-scale field tests. See page 26 for box culvert and footing details.

Size Feet-Inch		Metric Size mm		Area of Waterway (sq. ft.)	Minimum ^b Allowable Cover (ft.)	Crown Width A (N) ^c	Leg Length B (N) ^c	Total (N) ^c	Side Angle C (deg-min)
Span ^a	Rise ^a	Span ^a	Rise ^a						
9-8	2-7	2950	790	20.2	1.33	5	0	15	15-24
10-1	3-4	3070	1020	27.9	1.33	5	1	17	15-24
10-7	4-2	3230	1270	35.9	1.33	5	2	19	15-24
11-0	4-11	3350	1500	44.2	1.33	5	3	21	15-24
11-5	5-8	3480	1730	53.0	1.33	5	4	23	15-24
11-10	6-5	3610	1960	61.9	1.33	5	5	25	15-24
12-3	7-3	3730	2210	71.2	1.33	5	6	27	15-24
12-8	8-0	3860	2440	80.9	1.33	5	7	29	15-24
10-5	2-8	3180	810	23.1	1.33	6	0	16	14-28
10-10	3-5	3300	1040	31.2	1.33	6	1	18	14-28
11-2	4-3	3400	1300	39.7	1.33	6	2	20	14-28
11-7	5-0	3530	1520	48.4	1.33	6	3	22	14-28
12-0	5-9	3660	1750	57.7	1.33	6	4	24	14-28
12-5	6-7	3780	2010	67.0	1.33	6	5	26	14-28
12-10	7-4	3910	2240	76.9	1.33	6	6	28	14-28
13-3	8-2	4040	2490	85.1	1.33	6	7	30	14-28
11-1	2-9	3380	840	25.1	1.33	7	0	17	13-33
11-6	3-6	3510	1070	34.0	1.33	7	1	19	13-33
11-10	4-4	3610	1320	43.1	1.33	7	2	21	13-33
12-3	5-1	3730	1550	52.5	1.33	7	3	23	13-33
12-7	5-10	3840	1780	62.3	1.33	7	4	25	13-33
13-0	6-8	3960	2030	72.3	1.33	7	5	27	13-33
13-5	7-5	4090	2260	82.6	1.33	7	6	29	13-33
13-9	8-2	4190	2490	93.2	1.40	7	7	31	13-33
11-10	2-10	3610	860	28.0	1.33	8	0	18	12-40
12-2	3-8	3710	1120	37.4	1.33	8	1	20	12-40
12-6	4-5	3810	1350	47.0	1.33	8	2	22	12-40
12-10	5-2	3910	1570	57.0	1.33	8	3	24	12-40
13-3	6-0	4040	1830	67.1	1.33	8	4	26	12-40
13-7	6-9	4140	2060	77.6	1.40	8	5	28	12-40
13-11	7-6	4240	2290	88.2	1.40	8	6	30	12-40
14-3	8-4	4340	2540	97.5	1-40	8	7	32	12-40
12-6	2-11	3810	890	30.6	1.33	9	0	19	11-41
12-10	3-9	3910	1140	40.6	1.33	9	1	21	11-41
13-2	4-6	4010	1370	50.8	1.33	9	2	23	11-41
13-6	5-4	4110	1630	61.4	1.40	9	3	25	11-41
13-10	6-1	4220	1850	72.2	1.40	9	4	27	11-41
14-2	6-10	4320	2080	83.1	1.40	9	5	29	11-41
14-6	7-8	4420	2340	94.4	1.50	9	6	31	11-41
14-10	8-5	4520	2570	105.9	1.50	9	7	33	11-41
13-3	3-1	4040	940	33.8	1.33	10	0	20	10-46
13-6	3-10	4110	1170	44.3	1.40	10	1	22	10-46
13-10	4-8	4220	1420	55.1	1.40	10	2	24	10-46
14-1	5-5	4290	1650	66.0	1.40	10	3	26	10-46
14-5	6-2	4390	1880	77.2	1.40	10	4	28	10-46
14-9	7-0	4500	2130	88.8	1.50	10	5	30	10-46
15-0	7-9	45-70	2360	100.5	1.50	10	6	32	10-46
15-4	8-7	4670	2620	110.1	1.50	10	7	34	10-46
13-11	3-2	4240	970	36.6	1.40	11	0	21	9-51
14-2	3-11	4320	1190	47.8	1.40	11	1	23	9-51
14-6	4-9	4420	1450	59.1	1.50	11	2	25	9-51
14-9	5-6	4500	1680	70.7	1.50	11	3	27	9-51
15-0	6-4	4570	1930	82.4	1.50	11	4	29	9-51
15-4	7-1	4670	2160	94.5	1.50	11	5	31	9-51
15-7	7-11	4750	2410	106.8	1.60	11	6	33	9-51
15-10	8-8	4830	2640	119.2	1.60	11	7	35	9-51
14-7	3-3	4450	990	40.2	1.50	12	0	22	8-55
14-10	4-1	4520	1240	51.8	1.50	12	1	24	8-55
15-1	4-10	4600	1470	63.6	1.50	12	2	26	8-55
15-4	5-8	4670	1730	75.6	1.50	12	3	28	8-55
15-7	6-5	4750	1960	88.0	1.60	12	4	30	8-55
15-10	7-3	4830	2210	100.3	1.60	12	5	32	8-55
16-1	8-0	4900	2440	113.0	1.60	12	6	34	8-55
16-4	8-10	4980	2690	123.0	1.60	12	7	36	8-55

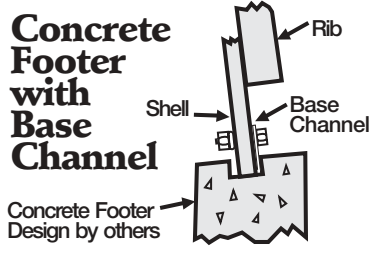
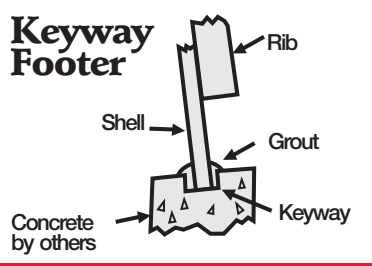
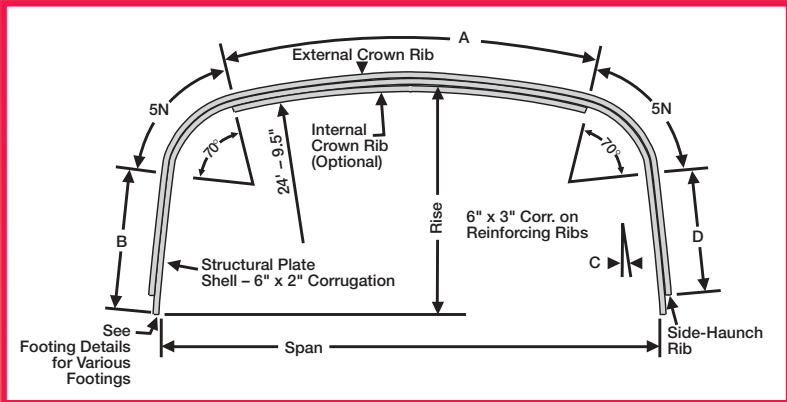
Size Feet-Inch		Metric Size mm		Area of Waterway (sq. ft.)	Minimum ^b Allowable Cover (ft.)	Crown Width A (N) ^c	Leg Length B (N) ^c	Total (N) ^c	Side Angle C (deg-min)
Span ^a	Rise ^a	Span ^a	Rise ^a						
15-3	3-5	4650	1040	43.3	1.50	13	0	23	8-00
15-6	4-2	4720	1270	55.9	1.60	13	1	25	8-00
15-9	5-0	4800	1520	68.1	1.60	13	2	27	8-00
16-0	5-9	4880	1750	80.7	1.60	13	3	29	8-00
16-2	6-7	4930	2010	93.2	1.60	13	4	31	8-00
16-5	7-4	5000	2240	106.5	1.60	13	5	33	8-00
16-8	8-2	5080	2490	119.7	1.70	13	6	35	8-00
16-10	8-11	5130	2720	133.0	1.70	13	7	37	8-00
16-0	3-6	4880	1070	47.1	1.60	14	0	24	7-04
16-2	4-4	4930	1320	59.9	1.60	14	1	26	7-04
16-4	5-1	4980	1550	72.8	1.60	14	2	28	7-04
16-7	5-11	5050	1800	85.8	1.70	14	3	30	7-04
16-9	6-9	5110	2060	99.1	1.70	14	4	32	7-04
17-0	7-6	5180	2290	112.4	1.70	14	5	34	7-04
17-2	8-4	5230	2540	126.0	1.70	14	6	36	7-04
17-5	9-1	5310	2770	137.0	1.70	14	7	38	7-04
16-8	3-8	5080	1120	50.7	1.70	15	0	25	6-09
16-10	4-6	5130	1370	64.1	1.70	15	1	27	6-09
17-0	5-3	5180	1600	77.6	1.70	15	2	29	6-09
17-2	6-1	5230	1850	91.3	1.70	15	3	31	6-09
17-4	6-10	5280	2080	105.1	1.70	15	4	33	6-09
17-6	7-8	5330	2340	119.1	1.80	15	5	35	6-09
17-8	8-5	5380	2570	133.2	1.80	15	6	37	6-09
17-10	9-3	5440	2820	147.4	1.80	15	7	39	6-09
17-14	3-10	5280	1170	55.0	1.70	16	0	26	5-14
17-6	4-7	5330	1400	68.8	1.80	16	1	28	5-14
17-7	5-5	5360	1650	82.8	1.80	16	2	30	5-14
17-9	6-2	5410	1880	96.8	1.80	16	3	32	5-14
17-11	7-0	5460	2130	111.1	1.80	16	4	34	5-14
18-1	7-9	5510	2360	125.4	1.80	16	5	36	5-14
18-3	8-7	5560	2620	139.8	1.80	16	6	38	5-14
18-5	9-4	5610	2840	151.2	1.80	16	7	40	5-14
18-0	3-11	5490	1190	58.8	1.80	17	0	27	4-18
18-1	4-9	5510	1450	73.3	1.80	17	1	29	4-18
18-3	5-7	5560	1700	87.9	1.80	17	2	31	4-18
18-4	6-4	5590	1930	102.6	1.80	17	3	33	4-18
18-6	7-2	5640	2180	117.3	1.90	17	4	35	4-18
18-7	7-11	5660	2410	132.3	1.90	17	5	37	4-18
18-9	8-9	5720	2670	147.3	1.90	17	6	39	4-18
18-10	9-6	5740	2900	162.4	1.90	17	7	41	4-18
18-8	4-1	5690	1240	63.4	1.90	18	0	28	3-23
18-9	4-11	5720	1500	78.4	1.90	18	1	30	3-23
18-10	5-8	5740	1730	93.4	1.90	18	2	32	3-23
18-11	6-6	5770	1980	108.5	1.90	18	3	34	3-23
19-1	7-4	5820	2240	123.6	1.90	18	4	36	3-23
19-2	8-1	5840	2460	138.9	1.90	18	5	38	3-23
19-3	8-11	5870	2720	154.2	1.90	18	6	40	3-23
19-4	9-8	5890	2950	166.0	1.90	18	7	42	3-23
19-4	4-3	5890	1300	67.7	1.90	19	0	29	2-28
19-5	5-1	5920	1550	83.3	1.90	19	1	31	2-28
19-6	5-10	5940	1780	98.9	2.00	19	2	33	2-28
19-6	6-8	5940	2030	114.6	2.00	19	3	35	2-28
19-7	7-5	5970	2260	126.6	2.00	19	4	37	2-28
19-8	8-3	5990	2510	146.2	2.00	19	5	39	2-28
19-9	9-1	6020	2770	162.0	2.00	19	6	41	2-28
19-10	9-10	6050	3000	178.0	2.00	19	7	43	2-28
20-8	4-7	6300	1400	77.5	2.10	21	0	31	0-37
20-8	5-5	6300	1650	94.1	2.10	21	1	33	0-37
20-8	6-2	6300	1880	110.7	2.10	21	2	35	0-37
20-8	7-0	6300	2130	127.4	2.10	21	3	37	0-37
20-9	7-10	6320	2390	143.3	2.10	21	4	39	0-37
20-9	8-7	6320	2620	160.7	2.10	21	5	41	0-37
20-9	9-5	6320	2870	177.4	2.10	21	6	43	0-37
20-9	10-2	6320	3100	194.2	2.10	21	7	45	0-37

Notes:

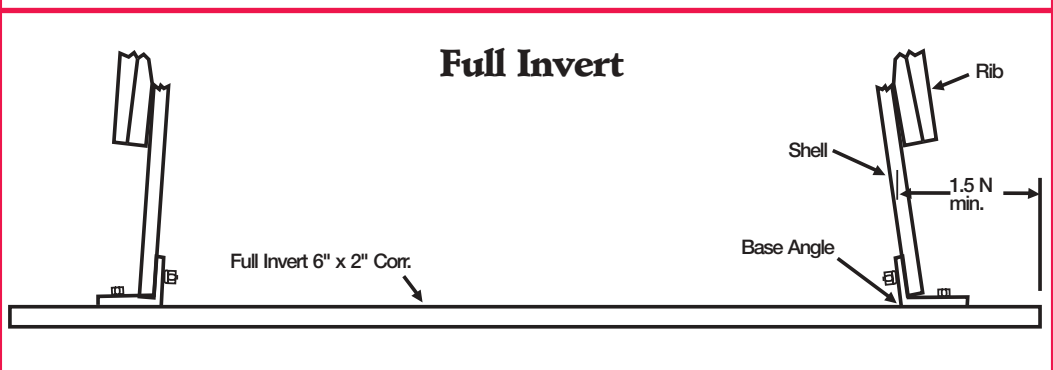
- a) Dimensions shown subject to manufacturing tolerances.
- b) Maximum allowable cover is 5 ft. Where cover in excess of 5 ft. is required, information is available on request. To determine minimum allowable cover elevation, add 3 inches to rise dimensions to allow for material thickness.
- c) N = 9-19/32 in.
- d) When interior ribs are used, waterway areas are reduced approximately 5%.



LOW PROFILE BOX CULVERT



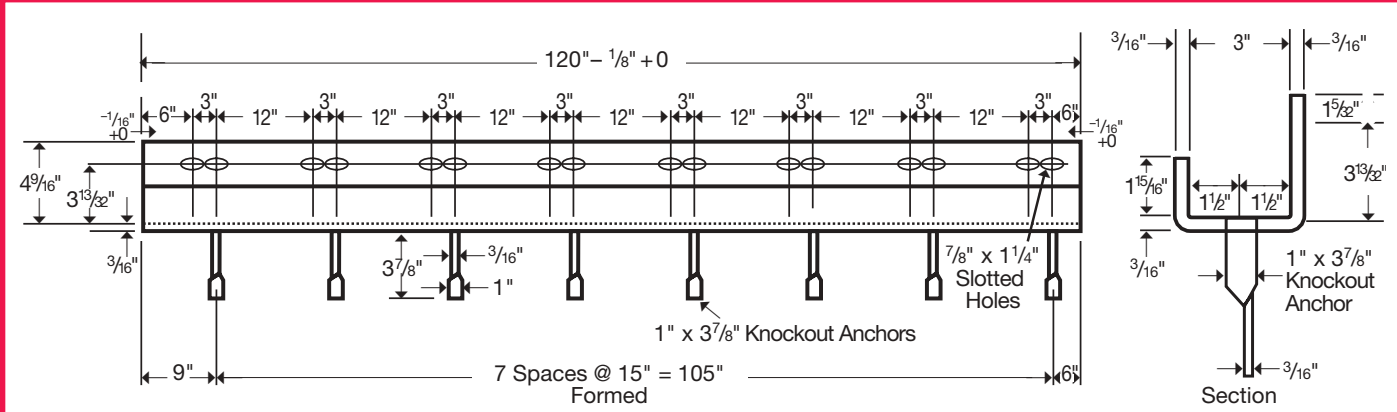
Footing Details



PRODUCT DETAILS AND SPECIFICATIONS

Base Channels for Arches

Arch plates may rest in a groove in the top of a concrete abutment, or a base channel can be fastened to the forms before the concrete is placed to provide a more secure connection. The channel is hot dip galvanized and bolts are furnished for a connection about every 15 inches.

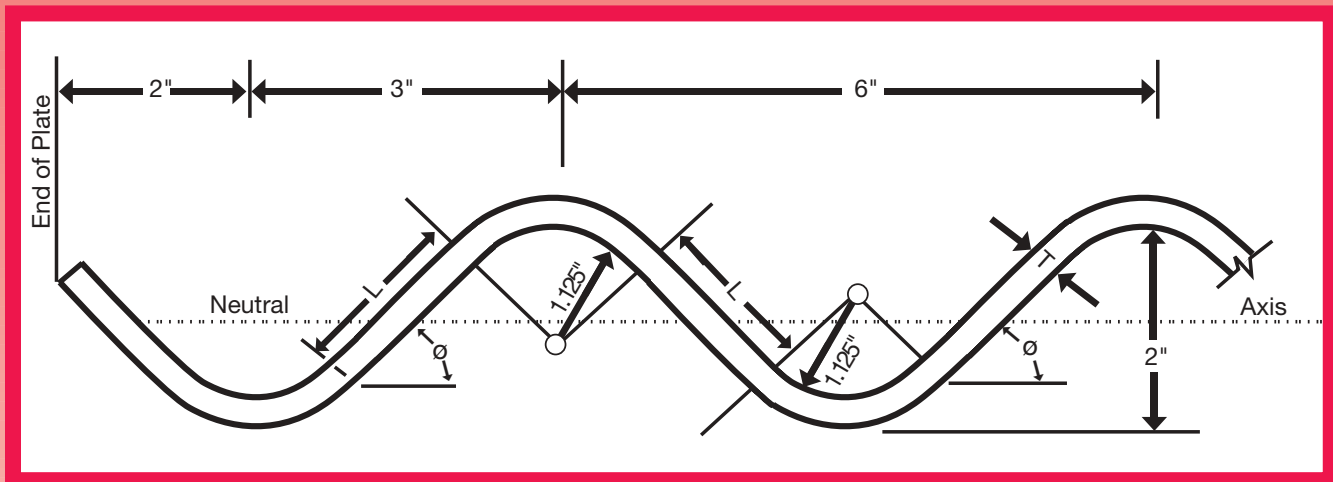


Approximate Weight of Structural Plate Sections

Total "N"	Net Length, Feet	Approximate Weight of Individual Plates Galvanized, in Pounds, Without Bolts*							Short Bolts Per Plate (Each Plate Also Has 4 Long Bolts)
		0.111 (12 Ga)	0.140 (10 Ga)	0.170 (8 Ga)	0.188 (7 Ga)	0.218 (5 Ga)	0.249 (3 Ga)	0.280 (1 Ga)	
3N	10	159	202	245	274	318	361	406	38
3N	12	189	241	293	327	380	432	485	46
5N	10	249	317	386	430	498	568	638	40
5N	12	398	379	461	514	596	679	763	48
6N	10	295	375	456	508	589	672	754	41
6N	12	352	449	545	607	705	803	902	49
7N	10	340	433	526	586	680	775	870	42
7N	12	406	517	628	701	813	926	1040	50

*Weights are approximate. Standard punching four holes per foot in longitudinal seams;
galvanized per AASHTO M167 with a 3 oz./ft.² coating.
Weight of bolts only, in pounds per hundreds: 1-1/4" = 32; 1-1/2" = 35; 1-3/4" = 37; 2" = 40; 3" = 53.
Weight of 100 hexagonal nuts = 20 pounds.
(1) Specified thickness is a nominal galvanized thickness.

Dimensions & Design Properties of Lane Structural Plate

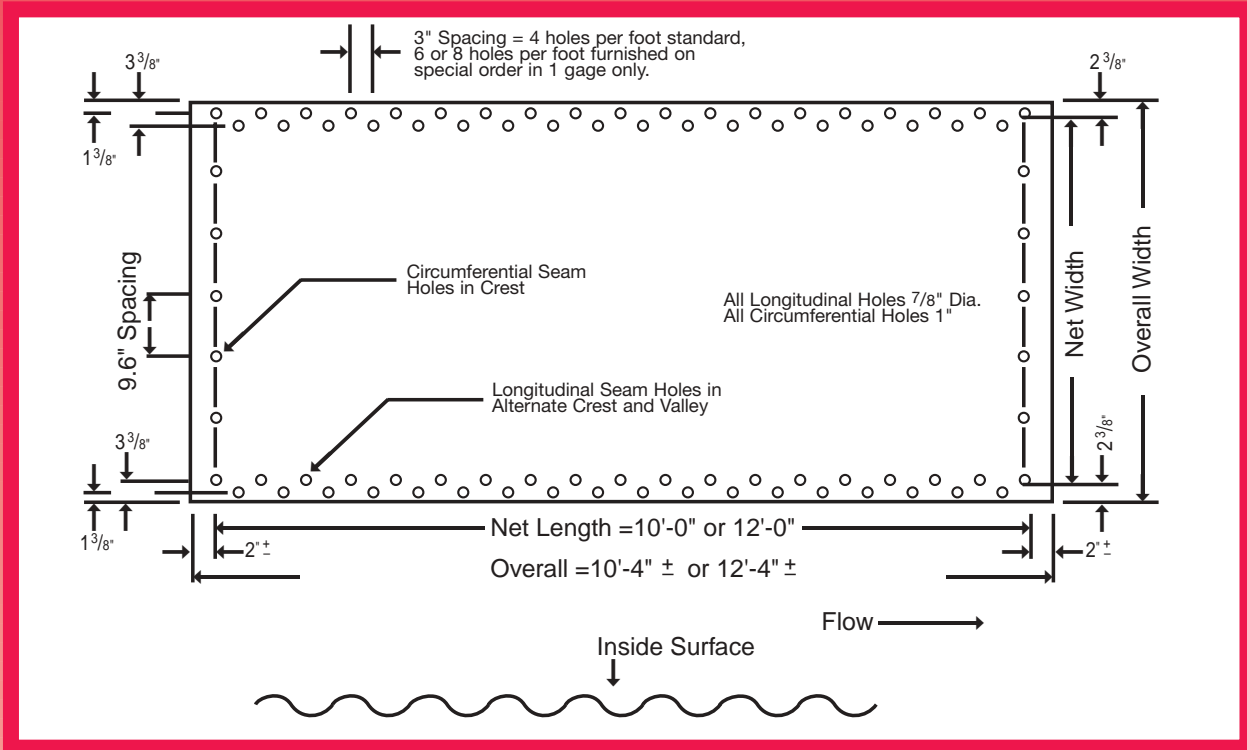


Gage	Foot Weight (lb./sq.ft.)	Uncoated Thickness "T" (inches)	Tangent Length "L" (inches)	Tangent Angle Ø (degrees)	Area of Section A* (in. ² /ft.)	Moment of Inertia I* (in. ⁴ /ft.)	Section Modulus S* (in. ³ /ft.)	Radius of Gyration R (inches)	Developed Width Factor
12	4.375	.1046	1.893	44.47	1.556	.725	.689	.682	1.240
10	5.625	.1345	1.861	44.73	2.003	.938	.879	.684	1.241
8	6.875	.1644	1.828	45.00	2.449	1.154	1.066	.686	1.242
7	7.500	.1838	1.807	45.18	2.739	1.296	1.187	.688	1.242
5	8.750	.2145	1.773	45.47	3.199	1.523	1.376	.690	1.243
3	10.000	.2451	1.738	45.77	3.658	1.754	1.562	.692	1.244
1	11.250	.2758	1.702	46.09	4.119	1.990	1.749	.695	1.245

*Values shown are for one foot of horizontal projection.

Details of Uncurved Structural Plate Sections

Width in "N"	Net Width, Inches		Overall Width, Inches	Spaces Between Bolt Holes at 9.6 inches	Number of Circumference Bolt Holes
3N	28.8	28-13/16	33-9/16	3	4
5N	48.0	48	52-3/4	5	6
6N	57.6	57-5/8	62-3/8	6	7
7N	67.2	67-3/16	71-15/16	7	8



For straight end structures on which headwalls are to be built, design should allow for a 2" lip at each end.

SPECIFICATIONS

Lane structural plate is covered by several nationally-known specifications, which cover material, design and installation requirements:

MATERIAL SPECIFICATIONS:

Plate

ASTM A761
 AASHTO M167
 AREA Part 4

Fasteners

ASTM A-307
 ASTM A-563 Grade C
 ASTM A-153
 ASTM A-449

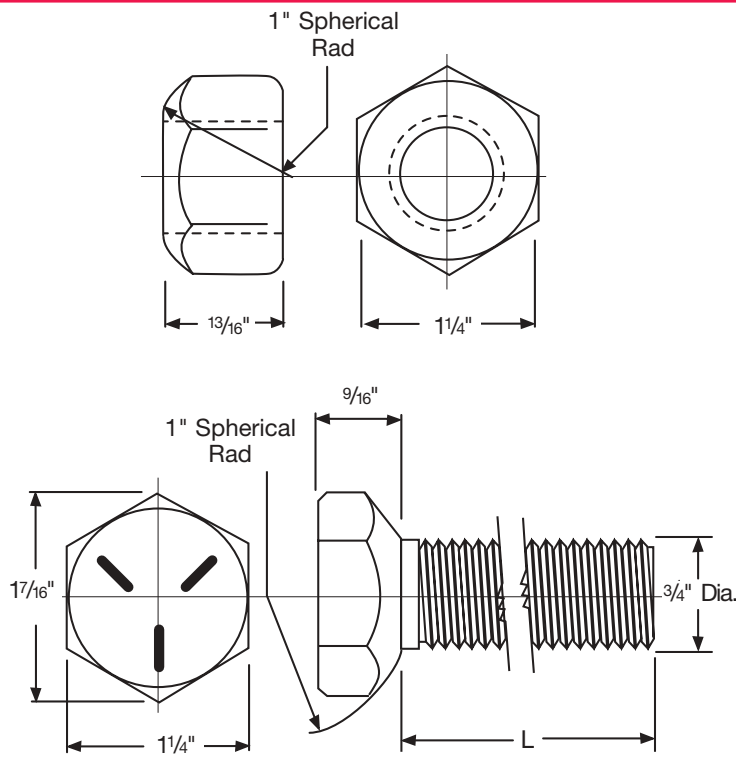
DESIGN SPECIFICATIONS

ASTM A796
 AASHTO Standard Specification for Highway Bridges,
 Division 1, Section 12
 AASHTO LRFD Bridge Design Specifications
 (new code for 1994)
 AREA Part 4

INSTALLATION SPECIFICATIONS

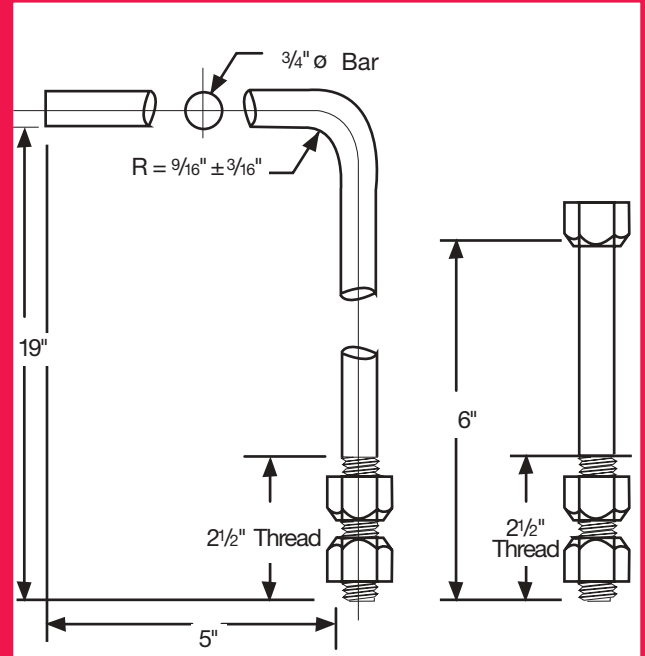
ASTM A807
 AASHTO Standard Specification
 for Highway Bridges,
 Division II, Section 26
 AREA Part 4

Note: Proper installation and backfill techniques are vitally important. Please reference above specifications upon installation.



Bolts

High strength 3/4" diameter bolts & nuts provided with Lane Structural Plate Structures conform to the requirements of ASTM A-449 and ASTM A-563 Grade C, respectively. They are hot dip galvanized to meet the requirements of ASTM A-153.

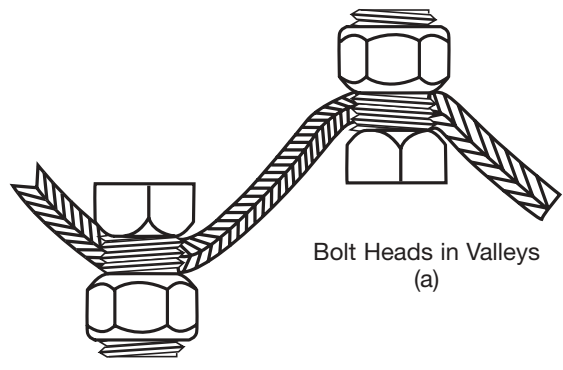


Hook Bolt

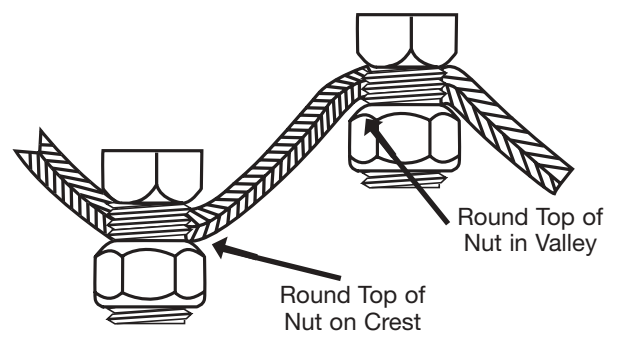
Anchor Bolt

Anchor Bolts

Anchor Bolts are available for anchoring the ends of structural plate conduits into concrete headwalls or other end treatment (when required). Material for these special 3/4" bolts conforms to ASTM Specification A-307, and A-563 Grade C for the nuts. Galvanizing of bolts and nuts conforms to ASTM A-153. Other sizes are available.



Bolt Heads in Valleys (a)



Bolt Heads Alternately on Crest and Valley (b)

Plate and Bolt Assembly Detail

Accepted practice is to insert bolts so that the bolt head is in the valley and the nut is on the crest of the corrugation. See Fig. a. If the structure is used where placement of the nuts on the inside crest is objectionable, the bolts can all be placed from the inside, so that the heads are on the crests and valleys alternately. See Fig. b.



HAT YOU WANT ... WHERE YOU WANT IT ... WHEN YOU WANT IT.

From consultation to installation, you can depend on Lane for your drainage product needs. As a full-line manufacturer of metal and HDPE plastic drainage products, Lane is able to provide the right product for your particular need. Regardless of the application, you can be assured a Lane product brings you the best in strength, durability and economy.

Corrugated Metal Pipe ... Lane fabricates and stocks a full range of corrugated metal pipe in a variety of materials, linings and coatings to meet specific durability and hydraulic requirements.

Spiral Rib Pipe ... Offers a smooth interior that provides excellent flow characteristics, while the specially designed exterior ribs assure strength. Available up to 102" (2550 mm) in diameter.

High Density Polyethylene Pipe (HDPE) ... Highly resistant to abrasion, chemical attack, soil and effluent conditions, Lane HDPE pipe has 100% annular corrugations, eliminating structural vulnerability at spiral seams. Single wall, smooth interior, perforated with fittings and accessories. AASHTO approved.

Specialty Fabrications ... Particularly those for storm water retention/detention systems, are all done in-house by experienced craftsmen. These include custom manifolds, control outlets, water quality structures, manholes, storm water management trash racks and risers. End sections in a variety of sizes and materials are available, and all standard connecting bands and fittings are kept in stock.

Open Top Slotted Drain ... The ability to accept high water volume (1.8" deep flow per 20 ft. section) makes this product perfect for roadside drainage, cross drains of intersections or driveways, interceptor drains at loading docks and interior drains at plants and factories.

Welded Wire Mesh Gabions ... Engineered for superior erosion control in tough, demanding applications. Spiral binders reduce assembly labor by up to 50%.

Rebar & Custom Powder Coating ... The Lane Technical Coatings Division operates three high volume coating lines that can apply epoxy, polyester or hybrid coating to parts up to 120" high by 48" wide by 100' long.

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