

Aluminum Box Culverts

The Solution for Small Bridge Replacement: Aluminum Box Culverts

Contech Aluminum Box Culverts are a practical and cost-efficient solution for small bridge replacement. They have a lower installed cost because they are faster and easier to install than cast-in-place concrete structures. There are no forms to set and remove, no delays due to curing time, large installation crews are unnecessary and no special equipment is needed. Also, no heavy cranes are required as with precast concrete structures.

These wide-span, low-rise structures are available in a large range of standard sizes (from 8'-9" span x 2'-6" rise to 35'-3" span x 13'-7" rise) that permit a minimum cover beginning as low as 17 inches, handling HS-20, HS-25, or HL-93 live loads.



Typical Metal Foundation Options



Lifting of Aluminum Box Culvert

Efficient Installations for Lower Installed Costs

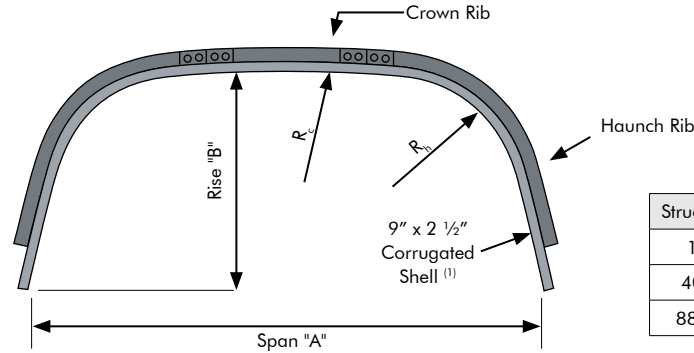
Closing roads for bridge replacement causes extensive traffic detours, so minimizing installation time is critical. Depending on length of structure, Aluminum Box Culverts may be erected in place and are usually ready to be backfilled within several days. For more efficient installations, Aluminum Box Culverts can be completely assembled nearby while the site is being prepared. Light equipment can then be used to pick and set them in place. For more information, contact your local Contech representative.



Installation of Ribs

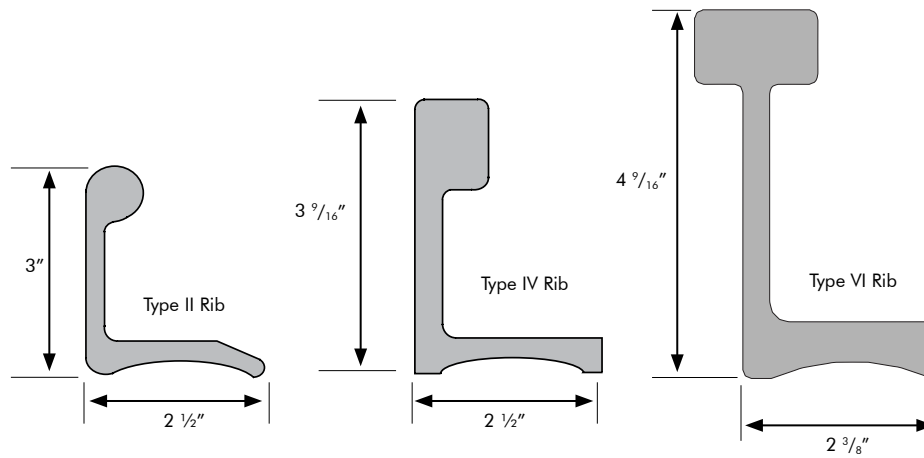


Corrugated Aluminum Headwall Package



Structure #	R_c	R_h
1-39	297.50"	30.250"
40-87	258.75"	37.380"
88-143	310.75"	43.625"

Box Culvert Shell Cross Section



Box Culvert Rib Geometry

Notes: (refer to pages 66-69)

- Structure 1 is a one-plate shell. Structures 2-26 are two plate shells. Structures 27-143 are three-plate shells.
- In Shell Fill Height Table 48A, 48B, 49A and 49B, the HG\CG designation indicates thickness or gage of haunch (HG) and crown (CG) plates as follows: 2=.125", 3=.150", 4=.175", 5=.200", 6=.225", 7=.250". Example: 3\6=.150" haunch and .225" crown plate thickness. The HRS/CRS designation indicates the rib spacing on the haunch (HRS) and crown (CRS) plates. Example: 27/9=27" o.c. haunch and 9" o.c. crown.
- Allowable cover (minimum and maximum) is measured from the outside valley of crown plate to bottom of flexible pavement or from the outside valley of crown plate to top of rigid pavement. Minimum cover is measured at the lowest fill area subjected to possible wheel loads (typically at the roadway shoulder). The roadway surface must be maintained to ensure minimum cover to prevent high-impact loads being imparted to the structure. Maximum cover is measured at highest fill and/or pavement elevation.
- Select the structure with the lowest alphabetical sub-designation and cover range that will include the actual minimum and maximum cover. Example: Structure 51-A6 is more economical than 51-B6 if the cover is between 3.0 and 4.5 feet.
- Shell Wt./Ft. shown is maximum handling weight and is based on heaviest component makeup for a specific span and rise combination. Weight per foot of shell includes plates, reinforcing ribs, rib splices, bolts, and nuts.
- Total structure length can be any dimension, but whenever possible, it is recommended to work with a multiple of 4.5' (net plate width). This practice usually results in lower total structure cost. Example: 50' proposed structure \div 4.5' = 11.1, nearest whole number is 11, therefore use 11 x 4.5' = 49.5' for total structure length. When ordering a structure with headwalls on each end, total structure length must be a multiple of 9 inches.
- Shell data in Table 48A is designed for standard highway HS-20 wheel loads, Table 48B for HS-25 loads and Tables 49A/49B for HL-93 load design information. Contact your local Contech representative for design information on other loadings.
- Standard structure designs use Type VI ribs for most economical plate and rib combination. Plate and rib combinations using Type II and Type IV ribs are available for special designs.
- The maximum cover for Aluminum Box Culverts with full inverts and footing pads should not exceed 4 feet. Special full invert and footing pad designs or slotted concrete footings can accommodate maximum covers to the limits shown in Tables 48A, 48B, 49A, and 49B.

Box Culvert Shell-Plate and Rib Data (H-20, HS-20)

TABLE 48A. SHELL DATA — H-20, HS-20 LOADING																		
PLATE AND RIB COMBINATIONS WITH ALLOWABLE HEIGHT OF COVER																		
Structure Number	Span "A" Ft.-In.	Rise "B" Ft.-In.	Area Sq. Ft.	A6					B6					C6				
				HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)
STRUCTURES 1 THROUGH 26 HAVE TYPE II HAUNCH AND TYPE IV CROWN RIBS																		
1	8-9	2-6	18.4	2/2	54/18	1.4	5.0	48										
2	9-2	3-3	25.4	2/2	54/18	1.4	5.0	53										
3	9-7	4-1	32.6	2/2	54/18	1.4	5.0	58										
4	10-0	4-10	40.2	2/2	54/18	1.4	5.0	61										
5	10-6	5-7	48.1	2/2	54/18	1.7	5.0	65	3/3	54/18	1.4	5.0	73					
6	10-11	6-4	56.4	2/2	54/18	2.0	5.0	69	2/2	27/18	1.4	5.0	77					
7	11-4	7-2	65.0	2/2	54/18	2.5	5.0	72	2/2	54/9	1.4	5.0	82					
8	10-2	2-8	23.0	2/2	54/18	1.7	5.0	56	3/3	54/18	1.4	5.0	62					
9	10-7	3-5	31.1	2/2	54/18	2.0	5.0	61	3/3	54/18	1.4	5.0	67					
10	10-11	4-3	39.5	2/2	54/18	2.0	5.0	65	3/3	54/18	1.4	5.0	72					
11	11-4	5-0	48.2	2/2	54/18	2.5	5.0	69	3/3	54/18	1.7	5.0	77	2/2	54/9	1.4	5.0	83
12	11-8	5-9	57.2	2/2	54/18	2.5	5.0	72	3/3	54/18	1.7	5.0	81	2/2	54/9	1.4	5.0	86
13	12-1	6-7	66.4	2/2	54/18	3.0	5.0	76	2/2	27/18	2.0	5.0	85	2/2	54/9	1.4	5.0	90
14	12-5	7-4	76.0	2/2	54/18	3.0	5.0	80	2/2	27/18	2.5	5.0	88	2/2	27/9	1.4	5.0	102
15	11-7	2-10	28.1	2/2	54/18	2.5	5.0	64	3/3	54/18	1.7	5.0	70	3/3	27/18	1.4	5.0	77
16	11-11	3-7	37.4	2/2	54/18	2.5	5.0	68	3/3	54/18	2.0	5.0	75	4/4	54/18	1.4	5.0	82
17	12-3	4-5	46.9	2/2	54/18	3.0	5.0	73	3/3	54/18	2.0	5.0	79	3/3	27/18	1.4	5.0	89
18	12-7	5-2	56.6	2/2	54/18	3.0	5.0	78	2/2	27/18	2.5	5.0	85	2/2	27/9	1.4	5.0	102
19	12-11	6-0	66.6	2/2	54/18	3.0	5.0	81	2/2	27/18	2.5	5.0	89	2/2	27/9	1.4	5.0	106
20	13-3	6-9	76.9	3/3	54/18	2.5	5.0	96	3/3	27/18	2.0	5.0	102	2/2	27/9	1.4	5.0	110
21	13-0	3-0	33.8	3/3	54/18	2.5	5.0	70	4/4	54/18	2.0	5.0	79	4/4	27/18	1.4	5.0	91
22	13-4	3-10	44.2	3/3	54/18	3.0	5.0	83	3/3	27/18	2.0	5.0	91	3/3	54/9	1.4	5.0	105
23	13-7	4-7	54.8	3/3	54/18	3.0	5.0	89	3/3	27/18	2.5	5.0	97	3/3	54/9	1.4	5.0	110
24	13-10	5-5	65.6	2/2	27/18	3.0	5.0	92	3/3	27/18	2.5	5.0	102	3/3	54/9	1.4	5.0	114
25	14-1	6-2	76.6	3/3	54/18	3.0	5.0	97	3/3	27/18	2.5	5.0	106	2/2	18/9	1.4	5.0	126
26	14-5	3-3	40.0	3/3	27/18	3.0	5.0	93	4/4	27/18	2.5	5.0	101	5/5	18/18	1.4	5.0	115
STRUCTURES 27 THROUGH 39 HAVE TYPE II HAUNCH AND TYPE VI CROWN RIBS																		
27	14-8	4-1	51.5	2/2	27/18	1.4	5.0	91										
28	14-10	4-10	63.2	2/2	27/18	1.4	5.0	106										
29	15-1	5-8	75.1	3/2	27/18	1.4	5.0	117										
30	15-4	6-5	87.2	3/2	27/18	1.4	5.0	121										
31	15-6	7-3	99.4	3/2	27/18	1.4	5.0	125										
32	15-9	8-0	111.8	2/2	27/18	2.0	5.0	121	3/2	18/18	1.4	5.0	136					
33	15-10	3-6	46.8	2/2	27/18	2.1	5.0	104	3/2	18/18	1.4	5.0	114					
34	16-0	4-3	59.5	2/2	27/18	2.3	5.0	110	3/2	18/18	1.4	5.0	121					
35	16-2	5-1	72.3	2/2	27/18	2.4	4.9	115	3/2	18/18	1.4	5.0	128					
36	16-4	5-11	85.2	2/2	27/18	2.6	4.5	119	3/2	18/18	1.4	5.0	133					
37	16-6	6-8	98.3	3/2	27/18	1.8	5.0	131	4/2	18/18	1.4	5.0	145					
38	16-8	7-6	111.5	3/2	27/18	1.9	5.0	135	4/2	18/18	1.4	5.0	150					
39	16-10	8-3	124.8	3/2	27/18	2.0	5.0	139	4/2	18/18	1.4	5.0	155					
STRUCTURES 40 THROUGH 87 USE ALL TYPE VI RIBS																		
40	17-9	3-10	54.4	2/2	54/18	2.0	5.0	112	2/2	27/18	1.4	5.0	124					
41	18-2	4-7	68.3	2/2	54/18	2.2	5.0	117	2/2	27/18	1.4	5.0	131					
42	18-7	5-4	82.5	2/2	54/18	2.4	5.0	123	2/2	27/18	1.4	5.0	139					
43	19-0	6-1	97.1	2/2	54/18	2.6	5.0	126	2/2	27/18	1.4	5.0	142					
44	19-5	6-11	111.9	2/2	54/18	2.8	5.0	130	2/2	18/18	1.4	5.0	159					
45	19-10	7-8	127.1	2/2	54/18	2.9	5.0	134	2/2	18/18	1.4	5.0	163					
46	20-3	8-5	142.6	2/2	27/18	1.9	5.0	137	2/2	18/18	1.4	5.0	166					
47	19-1	4-2	63.3	2/2	54/18	2.6	5.0	121	2/2	18/18	1.4	5.0	143					
48	19-5	4-11	78.3	2/2	54/18	2.8	5.0	126	2/2	18/18	1.4	5.0	152					
49	19-9	5-8	93.6	2/2	54/18	2.9	4.8	132	2/2	18/18	1.4	5.0	161					
50	20-1	6-6	109.2	2/2	27/18	1.9	5.0	151	2/2	18/18	1.4	5.0	165					
51	20-6	7-3	125.0	2/2	27/18	2.0	5.0	155	2/2	18/18	1.4	5.0	168					
52	20-10	8-1	141.2	2/2	27/18	2.1	5.0	159	2/2	18/18	1.4	5.0	172					
53	21-2	8-10	157.6	2/2	27/18	2.2	5.0	162	2/2	18/18	1.4	5.0	175					
54	20-4	4-6	73.1	2/2	27/18	2.0	5.0	142	2/2	18/18	1.4	5.0	152					
55	20-7	5-3	89.2	2/2	27/18	2.1	5.0	150	2/2	18/18	1.4	5.0	161					
56	20-11	6-1	105.5	2/2	27/18	2.2	5.0	157	2/2	18/18	1.4	5.0	170					
57	21-3	6-10	122.1	2/2	27/18	2.3	5.0	160	2/2	18/18	1.4	5.0	174					
58	21-6	7-8	139.0	2/2	27/18	2.3	5.0	164	2/2	18/18	1.4	5.0	177					
59	21-10	8-5	156.0	2/2	27/18	2.5	5.0	168	2/2	18/18	1.4	5.0	181					
60	22-1	9-3	173.3	2/2	27/18	2.5	4.8	171	2/3	18/18	1.4	5.0	189					
61	21-7	4-11	83.8	2/2	27/18	2.4	5.0	151	2/2	18/18	1.4	5.0	161					
62	21-10	5-8	101.0	2/2	27/18	2.5	5.0	159	2/2	18/18	1.4	5.0	170					
63	22-1	6-6	118.4	2/2	27/18	2.5	4.8	166	2/3	18/18	1.4	5.0	184					
64	22-3	7-3	135.9	2/2	27/18	2.6	4.6	169	2/3	18/18	1.4	5.0	188					
65	22-6	8-1	153.7	2/2	27/18	2.7	4.4	173	2/3	18/18	1.4	5.0	191					
66	22-9	8-10	171.6	2/2	27/18	2.8	4.2	177	2/4	18/18	1.4	5.0	195					
67	23-0	9-8	189.8	2/2	27/18	2.8	4.0	180	2/4	18/18	1.4	5.0	203					
68	22-9	5-4	95.5	2/2	27/18	2.8	4.2	160	2/4	18/18	1.4	5.0	180					
69	23-0	6-1	113.7	2/2	27/18	2.8	4.0	168	2/4	18/18	1.4	5.0	189					
70	23-2	6-11	132.1	3/3	27/18	2.6	4.4	188	2/5	18/18	1.4	5.0	203					
71	23-4	7-8	150.6	3/3	27/18	2.6	4.3	192	2/5	18/18	1.4	5.0	206					
72	23-6	8-6	169.3	3/3	27/18	2.7	4.2	197	2/5	18/18	1.4	5.0	210					
73	23-8	9-3	188.1	3/3	27/18	2.7	4.0	201	2/5	18/18	1.4	5.0	214					
74	23-10	10-1	207.0	3/3	27/18	2.8	3.9	205	2/5	18/18	1.4	5.0	217					
75	24-0	5-9	108.2	2/2	18/18	1.7	5.0	179	2/5	18/18	1.4	5.0	186					
76	24-1	6-6	127.5	2/2	18/18	1.7	5.0	188	2/6	18/18	1.4	5.0	210					
77	24-3	7-4	146.8	2/2	18/18	1.8	5.0	197	2/6	18/18	1.4	5.0	219					
78	24-4	8-2	166.2	2/2	18/18	1.8	5.0	201	2/6	18/18	1.4	5.0	223					
79	24-5	8-11	185.7	2/2	18/18	1.8	5.0	204	2/6	18/18	1.4	5.0	226					
80	24-7	9-9	205.3	2/2	18/18	1.8	5.0	208	2/6	18/18	1.4	5.0	230					
81	24-8	10-6	225.0	2/2	18/18	1.8	5.0	212	2/6	18/18	1.4	5.0	234					
82	25-2	6-2	122.0	2/2	18/18	1.9	4.9	188	2/6	18/18	1.4	5.0	210					
83	25-2	7-0	142.2	2/2	18/18	1.9	4.9	197	2/7	18/18	1.4	5.0	225					
84	25-3	7-9	162.4	2/2	18/18	1.9												

Box Culvert Shell-Plate and Rib Data (H-25, HS-25)

TABLE 48B. SHELL DATA — H-25, HS-25 LOADING																		
PLATE AND RIB COMBINATIONS WITH ALLOWABLE HEIGHT OF COVER																		
Structure Number	Span "A" Ft.-In.	Rise "B" Ft.-In.	Area Sq. Ft.	D6					E6					F6				
				HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)
STRUCTURES 1 THROUGH 20 HAVE TYPE II HAUNCH AND TYPE IV CROWN RIBS																		
1	8-9	2-6	18.4	2/2	54/18	1.7	5.0	48	3/3	54/18	1.4	5.0	53					
2	9-2	3-3	25.4	2/2	54/18	2.0	5.0	53	3/3	54/18	1.4	5.0	56					
3	9-7	4-1	32.6	2/2	54/18	2.0	5.0	58	3/3	54/18	1.4	5.0	60					
4	10-0	4-10	40.2	2/2	54/18	2.5	5.0	61	2/2	54/9	1.4	5.0	71					
5	10-6	5-7	48.1	2/2	54/18	2.5	5.0	65	2/2	54/9	1.4	5.0	75					
6	10-11	6-4	56.4	2/2	54/18	3.0	5.0	69	2/2	54/9	2.0	5.0	79	3/3	54/9	1.4	5.0	87
7	11-4	7-2	65.0	2/2	54/18	3.0	5.0	72	2/2	27/18	2.5	5.0	88	3/3	54/9	1.4	5.0	91
8	10-2	2-8	23.0	2/2	54/18	2.5	5.0	56	3/3	54/18	1.7	5.0	62	4/4	54/18	1.4	5.0	68
9	10-7	3-5	31.1	2/2	54/18	3.0	5.0	61	3/3	54/18	2.0	5.0	67	3/3	27/18	1.4	5.0	81
10	10-11	4-3	39.5	2/2	54/18	3.0	5.0	65	3/3	54/18	2.5	5.0	72	3/3	54/9	1.4	5.0	86
11	11-4	5-0	48.2	2/2	54/18	3.0	5.0	69	3/3	54/18	2.5	5.0	77	3/3	54/9	1.4	5.0	91
12	11-8	5-9	57.2	2/2	54/18	3.0	5.0	72	3/3	54/18	2.5	5.0	81	3/3	54/9	1.4	5.0	95
13	12-1	6-7	66.4	3/3	54/18	3.0	5.0	85	3/3	27/18	2.5	5.0	94	3/3	27/9	1.4	5.0	108
14	12-5	7-4	76.0	2/2	27/18	3.0	5.0	88	2/2	27/9	2.0	5.0	102	3/3	27/9	1.4	5.0	112
15	11-7	2-10	28.1	2/2	54/18	3.0	5.0	64	3/3	54/18	2.5	5.0	70	3/3	54/9	1.4	5.0	88
16	11-11	3-7	37.4	3/3	54/18	3.0	5.0	75	3/3	27/18	2.5	5.0	83	3/3	54/9	1.4	5.0	93
17	12-3	4-5	46.9	3/3	54/18	3.0	5.0	81	4/4	54/18	2.5	5.0	88	4/4	54/9	1.4	5.0	106
18	12-7	5-2	56.6	3/3	54/18	3.0	5.0	85	3/3	27/18	2.5	5.0	94	4/4	54/9	1.4	5.0	111
19	12-11	6-0	66.6	3/3	27/18	3.0	5.0	98	2/2	27/9	2.0	5.0	106	4/4	27/9	1.4	5.0	124
20	13-3	6-9	76.9	2/2	18/18	3.0	5.0	101	2/2	27/9	2.5	5.0	110	3/3	18/9	1.4	5.0	119
STRUCTURES 21 THROUGH 39 HAVE TYPE II HAUNCH AND TYPE VI CROWN RIBS																		
21	13-0	3-0	33.8	3/3	54/18	2.3	5.0	86	2/2	27/18	1.6	5.0	91	3/3	27/18	1.4	5.0	100
22	13-4	3-10	44.2	3/3	54/18	2.5	5.0	88	2/2	27/18	1.7	5.0	92	4/4	27/18	1.4	5.0	114
23	13-7	4-7	54.8	3/3	54/18	2.7	5.0	93	2/2	27/18	1.9	5.0	97	3/3	18/18	1.4	5.0	118
24	13-10	5-5	65.6	3/3	54/18	2.9	5.0	98	2/2	27/18	2.0	5.0	101	3/3	18/18	1.4	5.0	122
25	14-1	6-2	76.6	2/2	27/18	2.3	5.0	104	2/2	18/18	1.7	5.0	110	3/3	18/18	1.4	5.0	126
26	14-5	3-3	40.0	2/2	27/18	2.5	5.0	95	2/2	18/18	1.8	5.0	99	4/4	18/18	1.4	5.0	115
27	14-8	4-1	51.5	2/2	27/18	2.8	5.0	101	2/2	18/18	2.0	5.0	106	4/5	18/18	1.4	5.0	126
28	14-10	4-10	63.2	2/2	27/18	2.8	5.0	106	2/2	18/18	2.0	5.0	112	4/6	18/18	1.4	5.0	136
29	15-1	5-8	75.1	2/2	27/18	3.0	5.0	110	2/2	18/18	2.1	5.0	116	4/7	18/18	1.4	5.0	144
30	15-4	6-5	87.2	3/3	27/18	2.6	5.0	124	2/2	18/18	2.3	5.0	119	5/7	18/18	1.4	5.0	157
31	15-6	7-3	99.4	3/3	27/18	2.6	5.0	128	2/2	18/18	2.3	5.0	123	5/7	18/18	1.4	5.0	162
32	15-9	8-0	111.8	3/3	27/18	2.6	5.0	132	2/2	18/18	2.5	5.0	127	6/6	18/18	1.4	5.0	168
33	15-10	3-6	46.8	2/2	18/18	2.4	5.0	108	6/2	18/18	1.7	5.0	131	7/5	18/18	1.4	5.0	145
34	16-0	4-3	59.5	2/2	18/18	2.5	5.0	115	6/2	18/18	1.8	5.0	134	7/6	18/18	1.4	5.0	158
35	16-2	5-1	72.3	2/2	18/18	2.5	5.0	121	6/2	18/18	1.8	5.0	149	7/7	18/18	1.4	5.0	170
36	16-4	5-11	85.2	2/2	18/18	2.6	5.0	125	6/2	18/18	1.9	5.0	156	7/7	18/18	1.4	5.0	177
37	16-6	6-8	98.3	2/2	18/18	2.6	5.0	129	6/2	18/18	2.0	5.0	162	4/5	9/18	1.4	5.0	180
38	16-8	7-6	111.5	2/2	18/18	2.7	5.0	132	6/2	18/18	2.0	5.0	168	4/7	9/18	1.4	5.0	191
39	16-10	8-3	124.8	2/2	18/18	2.8	5.0	136	6/2	18/18	2.1	5.0	174	4/7	9/18	1.4	5.0	195
STRUCTURES 40 THROUGH 87 USE ALL TYPE VI RIBS																		
40	17-9	3-10	54.4	2/2	54/18	2.8	5.0	112	2/2	27/18	2.0	5.0	124	2/2	18/18	1.4	5.0	134
41	18-2	4-7	68.3	2/2	27/18	2.2	5.0	131	2/2	18/18	1.5	5.0	143	2/3	18/18	1.4	5.0	146
42	18-7	5-4	82.5	2/2	27/18	2.3	5.0	139	2/2	18/18	1.6	5.0	152	2/5	18/18	1.4	5.0	162
43	19-0	6-1	97.1	2/2	27/18	2.4	5.0	142	2/2	18/18	1.8	5.0	156	2/6	18/18	1.4	5.0	170
44	19-5	6-11	111.9	2/2	27/18	2.6	5.0	146	2/2	18/18	1.8	5.0	159	2/7	18/18	1.4	5.0	177
45	19-10	7-8	127.1	2/2	27/18	2.7	5.0	149	2/2	18/18	1.9	5.0	163	2/7	18/18	1.4	5.0	180
46	20-3	8-5	142.6	2/2	27/18	2.9	5.0	153	2/2	18/18	2.0	5.0	166	2/2	18/9	1.4	5.0	214
47	19-1	4-2	63.3	2/2	27/18	2.6	5.0	133	2/2	18/18	1.8	5.0	143	2/2	18/9	1.4	5.0	196
48	19-5	4-11	78.3	2/2	27/18	2.6	5.0	141	2/2	18/18	1.8	5.0	152	2/2	18/9	1.4	5.0	205
49	19-9	5-8	93.6	2/2	27/18	2.7	5.0	148	2/2	18/18	1.9	5.0	161	2/2	18/9	1.4	5.0	214
50	20-1	6-6	109.2	2/2	27/18	2.9	5.0	151	2/2	18/18	1.9	5.0	165	2/2	18/9	1.4	5.0	217
51	20-6	7-3	125.0	2/2	27/18	3.0	5.0	155	2/2	18/18	2.0	5.0	168	2/2	18/9	1.4	5.0	221
52	20-10	8-1	141.2	2/2	27/18	3.2	4.5	159	2/2	18/18	2.0	5.0	172	2/2	18/9	1.4	5.0	224
53	21-2	8-10	157.6	2/2	18/18	2.1	5.0	175	2/7	18/18	1.7	5.0	196	2/2	18/9	1.4	5.0	228
54	20-4	4-6	73.1	2/2	27/18	3.0	5.0	142	2/2	18/18	2.0	5.0	152	2/2	18/9	1.4	5.0	210
55	20-7	5-3	89.2	2/2	27/18	3.1	4.9	150	2/2	18/18	2.0	5.0	161	2/2	18/9	1.4	5.0	219
56	20-11	6-1	105.5	2/2	27/18	3.2	4.3	157	2/2	18/18	2.1	5.0	170	2/2	18/9	1.4	5.0	228
57	21-3	6-10	122.1	2/2	18/18	2.1	5.0	174	2/7	18/18	1.7	5.0	198	2/2	18/9	1.4	5.0	232
58	21-6	7-8	139.0	2/2	18/18	2.2	5.0	177	2/7	18/18	1.8	5.0	201	2/2	18/9	1.4	5.0	235
59	21-10	8-5	156.0	2/2	18/18	2.2	5.0	181	2/7	18/18	1.9	5.0	205	2/2	18/9	1.4	5.0	239
60	22-1	9-3	173.3	2/2	18/18	2.3	5.0	185	2/7	18/18	2.0	5.0	209	2/2	18/9	1.4	5.0	243
61	21-7	4-11	83.8	2/2	18/18	2.2	5.0	161	2/7	18/18	1.8	5.0	185	2/2	18/9	1.4	5.0	225
62	21-10	5-8	101.0	2/2	18/18	2.2	5.0	170	2/7	18/18	1.9	5.0	194	2/2	18/9	1.4	5.0	234
63	22-1	6-6	118.4	2/2	18/18	2.3	5.0	179	2/7	18/18	2.0	5.0	203	2/2	18/9	1.4	5.0	243
64	22-3	7-3	135.9	2/2	18/18	2.4	5.0	183	2/7	18/18	2.0	5.0	207	2/2	18/9	1.4	5.0	246
65	22-6	8-1	153.7	2/2	18/18	2.5	5.0	186	2/7	18/18	2.0	5.0	211	2/2	18/9	1.4	5.0	250
66	22-9	8-10	171.6	2/2	18/18	2.6	5.0	190	2/7	18/18	2.0	5.0	214	2/2	18/9	1.4	5.0	253
67	23-0	9-8	189.8	2/2	18/18	2.6	5.0	194	2/7	18/18	2.2	5.0	218	2/2	18/9	1.4	5.0	257
68	22-9	5-4	95.5	2/2	18/18	2.4	5.0	170	2/7	18/18	2.1	5.0	194	2/2	18/9	1.4	5.0	239
69	23-0	6-1	113.7	2/2	18/18	2.5	5.0	179	2/7	18/18	2.1	5.0	203	2/2	18/9	1.4	5.0	248
70	23-2	6-11	132.1	2/2	18/18	2.5	5.0	188	2/7	18/18	2.2	5.0	212	2/2	18/9	1.4	5.0	257
71	23-4	7-8	150.6	2/2	18/18	2.6	5.0	192	2/7	18/18	2.2	5.0	216	2/2	18/9	1.4	5.0	261
72	23-6	8-6	169.3	2/2	18/18	2.6	5.0	195	2/7	18/18	2.2	5.0	220	2/2	18/9	1.4	5.0	264
73	23-8	9-3	188.1	2/2	18/18	2.7	4.9	199	2/7	18/18	2.3	5.0	223	2/2	18/9	1.4	5.	

Box Culvert Shell-Plate and Rib Data (HL-93)

TABLE 49A. SHELL DATA — LRFD HL-93
PLATE AND RIB COMBINATIONS WITH ALLOWABLE HEIGHT OF COVER

Structure Number	Span "A" Ft.-In.	Rise "B" Ft.-In.	Area Sq. Ft.	R1			R2			R3								
				HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)
STRUCTURES 1 THROUGH 20 HAVE TYPE II HAUNCH AND TYPE IV CROWN RIBS																		
1	8-9	2-6	18.4	2/2	54/18	1.4	5.0	43										
2	9-2	3-3	25.4	2/2	54/18	1.4	5.0	50										
3	9-7	4-1	32.6	2/2	54/18	1.5	5.0	58	2/2	27/18	1.4	5.0	67					
4	10-0	4-10	40.2	2/2	54/18	1.7	5.0	61	2/2	27/18	1.4	5.0	70					
5	10-6	5-7	48.1	2/2	54/18	2.1	5.0	66	2/2	27/18	1.6	5.0	74	2/2	18/18	1.4	5.0	83
6	10-11	6-4	56.4	2/2	54/18	2.3	5.0	69	2/2	27/18	1.8	5.0	77	2/2	27/9	1.4	5.0	88
7	11-4	7-2	65.0	2/2	54/18	2.6	5.0	73	2/2	27/18	2.1	5.0	81	2/2	27/9	1.4	5.0	91
8	10-2	2-8	23.0	2/2	54/18	1.9	5.0	57	2/2	27/18	1.4	5.0	63					
9	10-7	3-5	31.1	2/2	54/18	2.1	5.0	61	2/2	27/18	1.6	5.0	68	2/2	18/18	1.4	5.0	76
10	10-11	4-3	39.5	2/2	54/18	2.3	5.0	66	2/2	27/18	1.8	5.0	74	2/2	27/9	1.4	5.0	88
11	11-4	5-0	48.2	2/2	54/18	2.6	5.0	70	2/2	27/18	2.1	5.0	78	2/2	27/9	1.4	5.0	92
12	11-8	5-9	57.2	2/2	54/18	2.8	5.0	73	2/2	27/18	2.3	5.0	81	2/2	27/9	1.4	5.0	95
13	12-1	6-7	66.4	2/2	54/18	3.1	5.0	77	2/2	27/18	2.6	5.0	85	2/2	27/9	1.4	5.0	99
14	12-5	7-4	76.0	2/2	54/18	3.4	5.0	80	2/2	27/9	1.5	5.0	102	2/2	18/9	1.4	5.0	111
15	11-7	2-10	28.1	2/2	54/18	2.7	5.0	64	2/2	27/18	2.3	5.0	70	2/2	27/9	1.4	5.0	88
16	11-11	3-7	37.4	2/2	54/18	2.9	5.0	69	2/2	27/18	2.5	5.0	76	2/2	27/9	1.4	5.0	94
17	12-3	4-5	46.9	2/2	54/18	3.2	5.0	73	2/2	27/18	2.7	5.0	82	2/2	18/9	1.4	5.0	108
18	12-7	5-2	56.6	2/2	54/18	4.1	5.0	77	2/2	27/18	2.9	5.0	85	2/2	18/9	1.4	5.0	111
19	12-11	6-0	66.6	3/3	54/18	2.9	5.0	90	2/2	27/9	1.8	5.0	106	3/3	18/9	1.4	5.0	121
20	13-3	6-9	76.9	3/3	54/18	3.2	5.0	94	2/2	27/9	2.0	5.0	110	3/3	18/9	1.4	5.0	125
STRUCTURES 21 THROUGH 39 HAVE TYPE II HAUNCH AND TYPE VI CROWN RIBS																		
21	13-0	3-0	33.8	3/3	54/18	2.0	5.0	81	2/2	27/18	1.4	5.0	83					
22	13-4	3-10	44.2	3/3	54/18	2.4	5.0	82	2/2	27/18	1.5	5.0	85	2/2	18/18	1.4	5.0	97
23	13-7	4-7	54.8	3/3	54/18	2.6	5.0	88	2/2	27/18	1.6	5.0	89	2/2	18/18	1.4	5.0	103
24	13-10	5-5	65.6	3/3	54/18	2.9	5.0	90	2/2	27/18	1.8	5.0	92	3/3	18/18	1.4	5.0	116
25	14-1	6-2	76.6	3/3	54/18	3.2	3.7	95	2/2	27/18	2.1	5.0	96	3/3	18/18	1.4	5.0	120
26	14-5	3-3	40.0	4/4	54/18	2.6	5.0	99	3/3	27/18	1.7	5.0	103	3/3	18/9	1.4	5.0	140
27	14-8	4-1	51.5	2/2	27/18	2.7	5.0	100	3/2	27/18	1.9	5.0	106	3/2	18/9	1.4	5.0	149
28	14-10	4-10	63.2	2/2	27/18	2.8	5.0	106	3/2	27/18	2.0	5.0	107	3/2	18/9	1.4	5.0	156
29	15-1	5-8	75.1	2/2	27/18	3.1	3.8	110	2/2	18/18	2.1	5.0	117	3/2	18/9	1.4	5.0	160
30	15-4	6-5	87.2	3/2	27/18	2.2	5.0	119	3/2	18/18	2.0	5.0	128	3/2	18/9	1.4	5.0	164
31	15-6	7-3	99.4	3/2	27/18	2.3	5.0	125	3/2	18/18	2.1	5.0	132	3/2	18/9	1.4	5.0	168
32	15-9	8-0	111.8	3/2	27/18	2.4	5.0	129	3/2	18/18	2.2	5.0	136	3/2	18/9	1.4	5.0	173
33	15-10	3-6	46.8	2/2	18/18	2.4	5.0	109	3/2	18/18	2.2	5.0	114	3/2	18/9	1.4	5.0	156
34	16-0	4-3	59.5	2/2	18/18	2.5	5.0	116	3/2	18/18	2.3	5.0	121	3/2	18/9	1.4	5.0	163
35	16-2	5-1	72.3	2/2	18/18	2.6	5.0	122	3/2	18/18	2.4	5.0	128	3/2	18/9	1.4	5.0	166
36	16-4	5-11	85.2	3/2	27/18	2.9	5.0	126	3/3	18/18	2.4	5.0	136	3/2	18/9	1.4	5.0	175
37	16-6	6-8	98.3	2/2	18/18	2.9	5.0	129	3/3	18/18	2.5	5.0	141	3/2	18/9	1.4	5.0	179
38	16-8	7-6	111.5	3/2	18/18	2.6	5.0	143	3/2	18/9	1.6	5.0	183	4/2	18/9	1.4	5.0	192
39	16-10	8-3	124.8	3/2	18/18	2.7	5.0	156	3/2	18/9	1.8	5.0	187	4/2	18/9	1.4	5.0	193
STRUCTURES 40 THROUGH 87 USE ALL TYPE VI RIBS																		
40	17-9	3-10	54.4	2/2	54/18	3.2	5.0	114	2/2	27/18	2.2	5.0	124	2/2	27/9	1.4	5.0	181
41	18-2	4-7	68.3	3/2	54/18	3.3	5.0	125	2/2	27/18	2.4	5.0	131	2/2	27/9	1.4	5.0	191
42	18-7	5-4	82.5	2/2	27/18	2.6	5.0	139	2/2	18/18	1.9	5.0	153	2/2	18/9	1.4	5.0	200
43	19-0	6-1	97.1	2/2	27/18	2.8	5.0	142	2/2	18/18	2.0	5.0	156	2/2	18/9	1.4	5.0	203
44	19-5	6-11	111.9	2/2	27/18	3.0	5.0	146	2/2	18/18	2.1	5.0	160	2/2	18/9	1.4	5.0	207
45	19-10	7-8	127.1	2/2	27/18	3.5	4.5	149	2/2	18/18	2.2	5.0	164	2/2	18/9	1.4	5.0	210
46	20-3	8-5	142.6	3/3	27/18	3.5	3.9	166	2/2	18/18	2.4	5.0	167	2/2	18/9	1.4	5.0	214
47	19-1	4-2	63.3	2/2	27/18	2.9	5.0	133	2/2	18/18	2.0	5.0	144	2/2	18/9	1.4	5.0	194
48	19-5	4-11	78.3	2/2	27/18	3.0	5.0	140	2/2	18/18	2.1	5.0	153	2/2	18/9	1.4	5.0	203
49	19-9	5-8	93.6	2/2	27/18	3.4	4.8	148	2/2	18/18	2.2	5.0	162	2/2	18/9	1.4	5.0	211
50	20-1	6-6	109.2	3/2	27/18	3.5	3.9	159	2/2	18/18	2.3	5.0	165	2/2	18/9	1.4	5.0	218
51	20-6	7-3	125.0	4/3	27/18	3.4	4.6	166	2/2	18/18	2.5	5.0	168	2/2	18/9	1.4	5.0	222
52	20-10	8-1	141.2	5/3	27/18	3.3	4.7	170	2/2	18/18	2.6	5.0	172	2/2	18/9	1.4	5.0	225
53	21-2	8-10	157.6	2/2	18/18	2.7	5.0	175	5/4	18/18	2.4	5.0	214	2/2	18/9	1.4	5.0	229
54	20-4	4-6	73.1	2/2	18/18	2.4	5.0	152	5/4	18/18	2.2	5.0	180	2/2	18/9	1.4	5.0	211
55	20-7	5-3	89.2	2/2	18/18	2.5	5.0	161	5/5	18/18	2.2	5.0	195	2/2	18/9	1.4	5.0	220
56	20-11	6-1	105.5	2/2	18/18	2.6	5.0	170	5/5	18/18	2.3	5.0	206	2/2	18/9	1.4	5.0	229
57	21-3	6-10	122.1	2/2	18/18	2.7	5.0	174	5/5	18/18	2.4	5.0	212	2/2	18/9	1.4	5.0	233
58	21-6	7-8	139.0	2/2	18/18	2.8	5.0	178	2/2	18/9	1.5	5.0	235	3/3	18/9	1.4	5.0	249
59	21-10	8-5	156.0	2/2	18/18	3.0	5.0	182	2/2	18/9	1.6	5.0	239	3/3	18/9	1.4	5.0	253
60	22-1	9-3	173.3	2/2	18/18	3.1	4.8	185	2/2	18/9	1.7	5.0	243	3/3	18/9	1.4	5.0	257
61	21-7	4-11	83.8	2/2	18/18	2.9	5.0	162	2/2	18/9	1.5	5.0	225	3/3	18/9	1.4	5.0	236
62	21-10	5-8	101.0	2/2	18/18	3.0	5.0	171	2/2	18/9	1.6	5.0	234	3/3	18/9	1.4	5.0	246
63	22-1	6-6	118.4	2/2	18/18	3.1	4.8	180	2/2	18/9	1.7	5.0	243	3/3	18/9	1.4	5.0	256
64	22-3	7-3	135.9	2/2	18/18	3.2	4.4	184	2/2	18/9	1.7	5.0	246	4/4	18/9	1.4	5.0	273
65	22-6	8-1	153.7	3/2	18/18	3.2	4.2	196	2/2	18/9	1.8	5.0	250	4/4	18/9	1.4	5.0	278
66	22-9	8-10	171.6	2/3	9/18	2.8	5.0	249	2/2	18/9	1.8	5.0	253	4/4	18/9	1.4	5.0	283
67	23-0	9-8	189.8	2/3	9/18	2.9	5.0	253	2/2	18/9	1.9	5.0	257	4/4	18/9	1.4	5.0	288
68	22-9	5-4	95.5	2/3	9/18	2.8	5.0	219	2/2	18/9	1.8	5.0	239	4/4	18/9	1.4	5.0	263
69	23-0	6-1	113.7	2/3	9/18	2.9	5.0	233	2/2	18/9	1.9	5.0	248	4/4	18/9	1.4	5.0	274
70	23-2	6-11	132.1	2/3	9/18	2.9	5.0	248	2/2	18/9	2.0	5.0	266	5/5	18/9	1.4	5.0	297
71	23-4	7-8	150.6	2/3	9/18	3.0	5.0	251	2/2	18/9	2.0	5.0	270	5/5	18/9	1.4	5.0	303
72	23-6	8-6	169.3	2/3	9/18	3.0	5.0	255	2/2	18/9	2.0	5.0	274	5/5	18/9	1.4	5.0	308
73	23-8	9-3	188.1	2/3	9/18	3.1	5.0	258	2/2	18/9	2.1	5.0	278	5/5	18/9	1.4	5.0	314
74	23-10	10-1	207.0	2														

Box Culvert Shell-Plate and Rib Data (HL-93)

TABLE 49B. SHELL DATA – LRFD HL-93																		
PLATE AND RIB COMBINATIONS WITH ALLOWABLE HEIGHT OF COVER																		
Structure Number	Span "A" Ft.-In.	Rise "B" Ft.-In.	Area Sq. Ft.	R1					R2					R3				
				HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)	HG/CG (Gage)	HRS/CRS (Inches)	Min. (Feet)	Max. (Feet)	Shell Wt./Ft. (Lbs.)
STRUCTURES 88 THROUGH 143 USE ALL TYPE VI RIBS																		
88	26-7	5-5	111.6	3/3	9/18	4.0	5.0	246	3/3	9/9	2.3	5.0	314	3/4	9/9	2.0	5.0	320
89	27-0	6-3	132.4	3/3	9/18	4.0	5.0	261	3/3	9/9	2.3	5.0	329	3/4	9/9	2.0	5.0	335
90	27-5	7-0	153.4	3/3	9/18	4.0	5.0	276	3/3	9/9	2.3	5.0	344	3/4	9/9	2.0	5.0	350
91	27-10	7-9	174.8	3/3	9/18	4.0	5.0	292	3/3	9/9	2.3	5.0	360	3/4	9/9	2.0	5.0	366
92	28-3	8-7	196.5	3/3	9/18	4.0	5.0	296	3/3	9/9	2.3	5.0	364	3/4	9/9	2.0	5.0	370
93	28-8	9-4	218.6	3/3	9/18	4.0	5.0	300	3/3	9/9	2.3	5.0	368	3/4	9/9	2.0	5.0	374
94	29-2	10-1	241.0	3/3	9/18	4.0	5.0	304	3/3	9/9	2.3	5.0	372	3/5	9/9	2.0	5.0	383
95	27-10	5-10	125.4	3/3	9/18	4.0	5.0	261	3/3	9/9	2.3	5.0	329	3/4	9/9	2.0	5.0	335
96	28-3	6-8	147.3	3/3	9/18	4.0	5.0	276	3/3	9/9	2.3	5.0	344	3/4	9/9	2.0	5.0	350
97	28-7	7-5	169.4	3/3	9/18	4.0	5.0	292	3/3	9/9	2.3	5.0	360	3/4	9/9	2.0	5.0	366
98	29-0	8-3	191.8	3/3	9/18	4.0	5.0	307	3/3	9/9	2.3	5.0	375	3/5	9/9	2.0	5.0	386
99	29-4	9-0	214.6	3/3	9/18	4.0	5.0	311	3/3	9/9	2.3	5.0	379	3/5	9/9	2.0	5.0	390
100	29-8	9-9	237.6	3/3	9/18	4.0	5.0	315	3/3	9/9	2.3	5.0	383	3/5	9/9	2.0	5.0	394
101	30-1	10-7	260.9	3/3	9/18	4.0	5.0	319	3/3	9/9	2.4	5.0	387	3/5	9/9	2.0	5.0	398
102	29-1	6-4	140.2	3/3	9/18	4.0	5.0	276	3/3	9/9	2.3	5.0	344	3/5	9/9	2.0	5.0	357
103	29-5	7-1	163.2	3/3	9/18	4.0	5.0	292	3/3	9/9	2.3	5.0	360	3/5	9/9	2.0	5.0	373
104	29-8	7-11	186.4	3/3	9/18	4.0	5.0	307	3/3	9/9	2.3	5.0	375	3/5	9/9	2.0	5.0	388
105	30-0	8-8	209.8	3/3	9/18	4.0	5.0	322	3/3	9/9	2.4	5.0	390	3/5	9/9	2.0	5.0	403
106	30-4	9-5	233.6	3/3	9/18	4.0	5.0	326	3/3	9/9	2.4	5.0	394	3/5	9/9	2.0	5.0	407
107	30-8	10-3	257.5	3/3	9/18	4.0	5.0	330	3/3	9/9	2.4	5.0	398	3/5	9/9	2.0	5.0	411
108	31-0	11-0	281.8	3/3	9/18	4.0	5.0	335	3/3	9/9	2.4	5.0	403	3/5	9/9	2.0	5.0	416
109	30-3	6-9	156.1	3/3	9/18	4.0	5.0	287	3/3	9/9	2.5	5.0	360	3/5	9/9	2.0	5.0	373
110	30-6	7-7	180.1	3/3	9/18	4.0	5.0	302	3/3	9/9	2.4	5.0	375	3/5	9/9	2.0	5.0	388
111	30-10	8-4	204.4	3/3	9/18	4.0	5.0	317	3/3	9/9	2.4	5.0	390	3/5	9/9	2.0	5.0	403
112	31-1	9-2	228.8	3/3	9/18	4.0	5.0	332	3/3	9/9	2.4	5.0	405	3/5	9/9	2.0	5.0	418
113	31-4	9-11	253.5	4/3	9/18	4.0	5.0	346	3/3	9/9	2.5	5.0	409	3/5	9/9	2.0	5.0	422
114	31-8	10-9	278.4	4/3	9/18	4.0	5.0	351	3/3	9/9	2.5	5.0	414	3/5	9/9	2.0	5.0	427
115	31-11	11-6	303.5	4/3	9/18	4.0	5.0	356	3/3	9/9	2.5	5.0	418	3/5	9/9	2.0	5.0	431
116	31-5	7-3	173.1	4/3	9/18	4.0	5.0	304	3/3	9/9	2.5	5.0	375	3/5	9/9	2.0	5.0	388
117	31-8	8-0	198.2	4/3	9/18	4.0	5.0	320	3/3	9/9	2.5	5.0	390	3/5	9/9	2.0	5.0	403
118	31-10	8-10	223.4	4/3	9/18	4.0	5.0	336	3/3	9/9	2.5	5.0	405	3/5	9/9	2.0	5.0	418
119	32-1	9-8	248.8	4/3	9/18	4.0	5.0	352	3/3	9/9	2.5	5.0	420	3/5	9/9	2.0	5.0	433
120	32-3	10-5	274.4	4/3	9/18	4.0	5.0	357	3/3	9/9	2.5	5.0	424	3/5	9/9	2.0	5.0	437
121	32-7	11-3	300.1	4/3	9/18	4.0	5.0	362	3/3	9/9	2.5	5.0	429	3/5	9/9	2.0	5.0	442
122	32-8	12-0	326.1	4/3	9/18	4.0	5.0	367	3/3	9/9	2.5	5.0	433	3/5	9/9	2.0	5.0	446
123	32-7	7-9	191.3	4/3	9/18	4.0	5.0	314	3/3	9/9	2.5	5.0	390	3/5	9/9	2.0	5.0	403
124	32-9	8-6	217.3	4/3	9/18	4.0	5.0	330	3/3	9/9	2.5	5.0	405	3/5	9/9	2.0	5.0	418
125	32-11	9-4	243.4	4/3	9/18	4.0	5.0	346	3/3	9/9	2.5	5.0	420	3/5	9/9	2.0	5.0	433
126	33-1	10-2	269.7	4/3	9/18	4.0	5.0	362	3/3	9/9	2.5	5.0	435	3/5	9/9	2.0	5.0	448
127	33-3	10-11	296.4	4/3	9/18	4.0	5.0	367	3/3	9/9	2.5	5.0	440	3/6	9/9	2.0	5.0	454
128	33-5	11-9	322.8	4/3	9/18	4.0	5.0	372	3/3	9/9	2.5	5.0	444	3/6	9/9	2.0	5.0	466
129	33-8	12-6	349.5	4/3	9/18	4.0	5.0	376	3/3	9/9	2.5	5.0	448	3/6	9/9	2.0	5.0	470
130	33-8	8-3	210.5	4/3	9/18	4.0	5.0	325	3/3	9/9	2.5	5.0	405	3/6	9/9	2.0	5.0	427
131	33-9	9-1	237.5	4/3	9/18	4.0	5.0	340	3/3	9/9	2.5	5.0	420	3/6	9/9	2.0	5.0	442
132	33-11	9-10	264.5	4/3	9/18	4.0	5.0	356	3/3	9/9	2.5	5.0	435	3/6	9/9	2.0	5.0	457
133	34-0	10-8	291.7	4/3	9/18	4.0	5.0	372	3/3	9/9	2.5	5.0	451	3/6	9/9	2.0	5.0	473
134	34-2	11-5	319.0	4/3	9/18	4.0	5.0	377	3/3	9/9	2.5	5.0	455	3/6	9/9	2.0	5.0	477
135	34-3	12-3	346.4	4/3	9/18	4.0	5.0	382	3/3	9/9	2.5	5.0	459	3/6	9/9	2.0	5.0	481
136	34-5	13-1	373.8	4/3	9/18	4.0	5.0	387	3/3	9/9	2.5	5.0	463	3/6	9/9	2.0	5.0	485
137	34-9	8-9	230.9	4/3	9/18	4.0	5.0	335	3/3	9/9	2.5	5.0	420	3/6	9/9	2.0	5.0	442
138	34-10	9-7	258.1	4/3	9/18	4.0	5.0	351	3/3	9/9	2.5	5.0	435	3/6	9/9	2.0	5.0	457
139	34-11	10-4	286.7	4/3	9/18	4.0	5.0	367	3/3	9/9	2.5	5.0	451	3/6	9/9	2.0	5.0	473
140	35-0	11-2	314.6	4/3	9/18	4.0	5.0	382	3/3	9/9	2.5	5.0	466	3/6	9/9	2.0	5.0	488
141	35-1	12-0	342.7	4/3	9/18	4.0	5.0	387	3/3	9/9	2.5	5.0	470	3/6	9/9	2.0	5.0	492
142	35-2	12-9	370.8	4/3	9/18	4.0	5.0	392	3/3	9/9	2.5	5.0	474	3/6	9/9	2.0	5.0	496
143	35-3	13-7	399.0	4/3	9/18	4.0	5.0	394	3/3	9/9	2.5	5.0	476	3/6	9/9	2.0	5.0	500



Fully Assembled Aluminum Box Culvert Being Set in Place

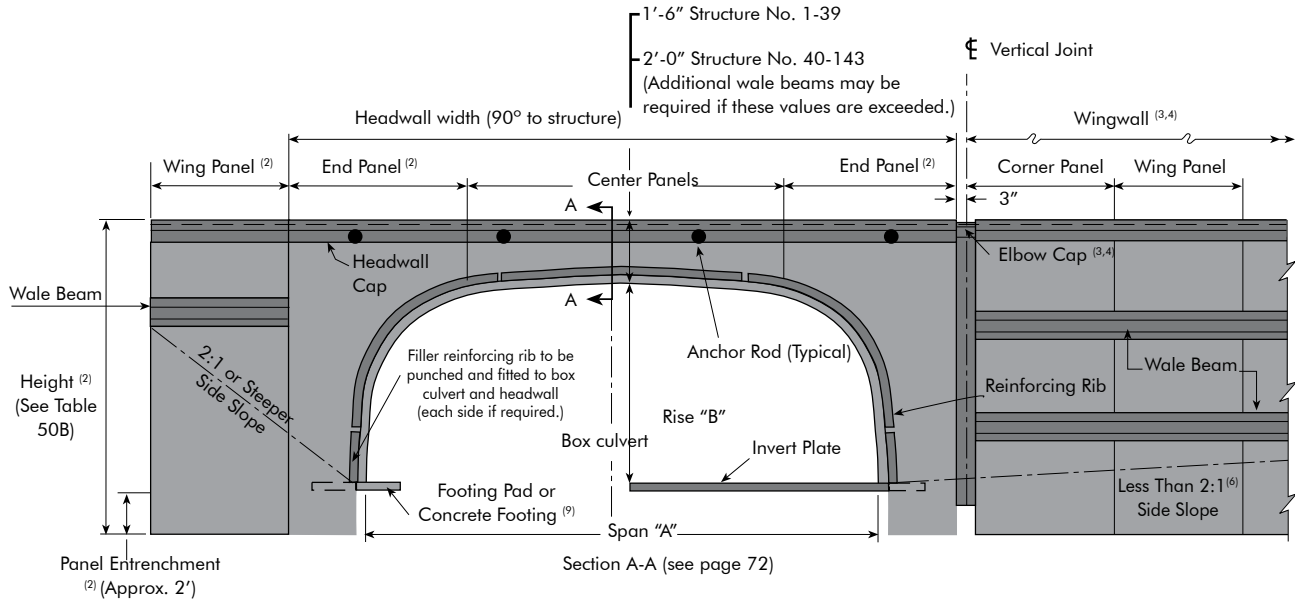
Aluminum Box Culvert

TABLE 49C. ALBC STRUCTURE AREA, PLATE AND RIB MAKE-UP

Box #	Inside Dimensions		Inside Flow Area	Crown Arc Length (N)	Haunch Arc Length (N)	Straight Leg Length "D" (N)	Total (N)	Plate Make-Up		Side Angle "E" (deg.)	Box #	Inside Dimensions		Inside Flow Area	Crown Arc Length (N)	Haunch Arc Length (N)	Straight Leg Length "D" (N)	Total (N)	Plate Make-Up		Side Angle "E" (deg.)	
	Span	Rise						Haunch (N)	Crown (N)			Haunch (N)	Crown (N)						Haunch (N)	Crown (N)		
1	8'-9"	2'-6"	18.4			.5	14	14	NA		75	24'-0"	5'-9"	108.2			.5	36	10			
2	9'-2"	3'-3"	25.4			1.5	16	8			76	24'-1"	6'-6"	127.5			1.5	38	11			
3	9'-7"	4'-1"	32.6			2.5	18	9			77	24'-3"	7'-4"	146.8			2.5	40	12			
4	10'-0"	4'-10"	40.2	5	4	3.5	20	10		15.40	78	24'-4"	8'-2"	166.2	27	4	3.5	42	13	16	4.30	
5	10'-6"	5'-7"	48.1			4.5	22	11			79	24'-5"	8'-11"	185.7			4.5	44	14			
6	10'-11"	6'-4"	56.4			5.5	24	12			80	24'-7"	9'-9"	205.3			5.5	46	15			
7	11'-4"	7'-2"	65.0			6.5	26	13			81	24'-8"	10'-6"	225.0			6.5	48	16			
8	10'-2"	2'-8"	23.0			.5	16	8			82	25'-2"	6'-2"	122.0			.5	38	11			
9	10'-7"	3'-5"	31.1			1.5	18	9			83	25'-2"	7'-0"	142.2			1.5	40	12			
10	10'-11"	4'-3"	39.5			2.5	20	10			84	25'-3"	7'-9"	162.4	29	4	2.5	42	13	16	2.18	
11	11'-4"	5'-0"	48.2	7	4	3.5	22	11		13.55	85	25'-4"	8'-7"	182.6			3.5	44	14			
12	11'-8"	5'-9"	57.2			4.5	24	12			86	25'-4"	9'-5"	202.9			4.5	46	15			
13	12'-1"	6'-7"	66.4			5.5	26	13			87	25'-5"	10'-2"	223.3			5.5	48	16			
14	12'-5"	7'-4"	76.0			6.5	28	14														
15	11'-7"	2'-10"	28.1			.5	18	9														
16	11'-11"	3'-7"	37.4			1.5	20	10			88	26'-7"	5'-5"	111.6			.5	38	11			
17	12'-3"	4'-5"	46.9			2.5	22	11			89	27'-0"	6'-3"	132.4			1.5	40	12			
18	12'-7"	5'-2"	56.6			3.5	24	12			90	27'-5"	7'-0"	153.4			2.5	42	13			
19	12'-11"	6'-0"	66.6			4.5	26	13			91	27'-10"	7'-9"	174.8	29	4	3.5	44	14	16	15.22	
20	13'-3"	6'-9"	76.9			5.5	28	14			92	28'-3"	8'-7"	196.5			4.5	46	15			
21	13'-0"	3'-0"	33.8			.5	20	10			93	28'-8"	9'-4"	218.6			5.5	48	16			
22	13'-4"	3'-10"	44.2			1.5	22	11			94	29'-2"	10'-1"	241.0			6.5	50	17			
23	13'-7"	4'-7"	54.8	11	4	2.5	24	12		9.87	95	27'-10"	5'-10"	125.4			.5	40	12			
24	13'-10"	5'-5"	65.6			3.5	26	13			96	28'-3"	6'-8"	147.3			1.5	42	13			
25	14'-1"	6'-2"	76.6			4.5	28	14			97	28'-7"	7'-5"	169.4			2.5	44	14			
26	14'-5"	3'-3"	40.0			.5	22	11			98	29'-0"	8'-3"	191.8	31	4	3.5	46	15	16	13.45	
27	14'-8"	4'-1"	51.5			1.5	24	8			99	29'-4"	9'-0"	214.6			4.5	48	16			
28	14'-10"	4'-10"	63.2			2.5	26	9			100	29'-8"	9'-9"	237.6			5.5	50	17			
29	15'-1"	5'-8"	75.1			3.5	28	10	8	8.02	101	30'-1"	10'-7"	260.9			6.5	52	18			
30	15'-4"	6'-5"	87.2			4.5	30	11			102	29'-1"	6'-4"	140.2			.5	42	12			
31	15'-6"	7'-3"	99.4			5.5	32	12			103	29'-5"	7'-1"	163.2			1.5	44	13			
32	15'-9"	8'-0"	111.8			6.5	34	13			104	29'-8"	7'-11"	186.4			2.5	46	14			
33	15'-10"	3'-6"	46.8			.5	24	8			105	30'-0"	8'-8"	209.8	33	4	3.5	48	15	18	11.68	
34	16'-0"	4'-3"	59.5			1.5	26	9			106	30'-4"	9'-5"	233.6			4.5	50	16			
35	16'-2"	5'-1"	72.3			2.5	28	10			107	30'-8"	10'-3"	257.5			5.5	52	17			
36	16'-4"	5'-11"	85.2	15	4	3.5	30	11	8	6.17	108	31'-0"	11'-0"	281.8			6.5	54	18			
37	16'-6"	6'-8"	98.3			4.5	32	12			109	30'-3"	6'-9"	156.1			.5	44	13			
38	16'-8"	7'-6"	111.5			5.5	34	13			110	30'-6"	7'-7"	180.1			1.5	46	14			
39	16'-10"	8'-3"	124.8			6.5	36	14			111	30'-10"	8'-4"	204.4			2.5	48	15			
40	17'-9"	3'-10"	54.4			.5	26	8			112	31'-1"	9'-2"	228.8	35	4	3.5	50	16	18	9.92	
41	18'-2"	4'-7"	68.3			1.5	28	9			113	31'-4"	9'-11"	253.5			4.5	52	17			
42	18'-7"	5'-4"	82.5			2.5	30	10			114	31'-8"	10'-9"	278.4			5.5	54	18			
43	19'-0"	6'-1"	97.1	17	4	3.5	32	11	10	14.90	115	31'-11"	11'-6"	303.5			6.5	56	19			
44	19'-5"	6'-11"	111.9			4.5	34	12			116	31'-5"	7'-3"	173.1			.5	46	14			
45	19'-10"	7'-8"	127.1			5.5	36	13			117	31'-8"	8'-0"	198.2			1.5	48	15			
46	20'-3"	8'-5"	142.6			6.5	38	14			118	31'-10"	8'-10"	223.4			2.5	50	16			
47	19'-1"	4'-2"	63.3			.5	28	8			119	32'-1"	9'-8"	248.8	37	4	3.5	52	17	18	8.15	
48	19'-5"	4'-11"	78.3			1.5	30	9			120	32'-3"	10'-5"	274.4			4.5	54	18			
49	19'-9"	5'-8"	93.6			2.5	32	10			121	32'-7"	11'-3"	300.1			5.5	56	19			
50	20'-1"	6'-6"	109.2	19	4	3.5	34	11	12	12.78	122	32'-8"	12'-0"	326.1			6.5	58	20			
51	20'-6"	7'-3"	125.0			4.5	36	12			123	32'-7"	7'-9"	191.3			.5	48	14			
52	20'-10"	8'-1"	141.2			5.5	38	13			124	32'-9"	8'-6"	217.3			1.5	50	15			
53	21'-2"	8'-10"	157.6			6.5	40	14			125	32'-11"	9'-4"	243.4			2.5	52	16			
54	20'-4"	4'-6"	73.1			.5	30	8			126	33'-1"	10'-2"	269.7	39	4	3.5	54	17	20	6.37	
55	20'-7"	5'-3"	89.2			1.5	32	9			127	33'-3"	10'-11"	296.4			4.5	56	18			
56	20'-11"	6'-1"	105.5			2.5	34	10			128	33'-5"	11'-9"	322.8			5.5	58	19			
57	21'-3"	6'-10"	122.1	21	4	3.5	36	11	14	10.67	129	33'-8"	12'-6"	349.5			6.5	60	20			
58	21'-6"	7'-8"	139.0			4.5	38	12			130	33'-8"	8'-3"	210.5			.5	50	15			
59	21'-10"	8'-5"	156.0			5.5	40	13			131	33'-9"	9'-1"	237.5			1.5	52	16			
60	22'-1"	9'-3"	173.3			6.5	42	14			132	33'-11"	9'-10"	264.5			2.5	54	17			
61	21'-7"	4'-11"	83.8			.5	32	9			133	34'-0"	10'-8"	291.7	41	4	3.5	56	18	20	4.62	
62	21'-10"	5'-8"	101.0			1.5	34	10			134	34'-2"	11'-5"	319.0			4.5	58	19			
63	22'-1"	6'-6"	118.4			2.5	36	11			135	34'-3"	12'-3"	346.4			5.5	60	20			
64	22'-3"	7'-3"	135.9	23	4	3.5	38	12	14	8.53	136	34'-5"	13'-1"	373.8			6.5	62	21			
65	22'-6"	8'-1"	153.7			4.5	40	13			137	34'-9"	8'-9"	230.9			.5	52	16			
66	22'-9"	8'-10"	171.6			5.5	42	14			138	34'-10"	9'-7"	258.1			1.5	54	17			
67	23'-0"	9'-8"	189.8			6.5	44	15			139	34'-11"	10'-4"	286.7			2.5	56	18			
68	22'-9"	5'-4"	95.5			.5	34	10			140	35'-0"	11'-2"	314.6	43	4	3.5	58	19	20	2.85	
69	23'-0"	6'-1"	113.7			1.5	36	11			141	35'-1"	12'-0"	342.7			4.5	60	20			
70	23'-2"	6'-11"	132.1			2.5	38	12			142	35'-2"	12'-9"	370.8			5.5	62	21			
71	23'-4"	7'-8"	150.6	25	4	3.5	40	13	14	6.42	143	35'-3"	13'-7"	399.0			6.5	64	22			
72	23'-6"	8'-6"	169.3			4.5	42	14														
73	23'-8"	9'-3"	188.1			5.5	44	15														
74	23'-10"	10'-1"	207.0			6.5	46	16														

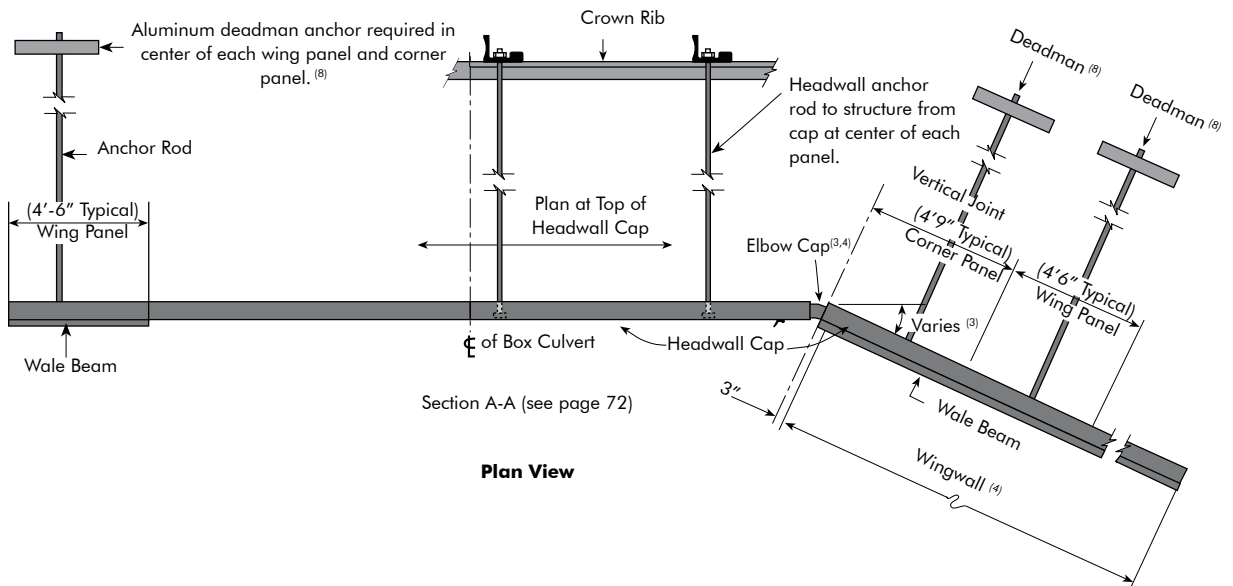
Notes:
1. Box #1 is a one plate shell.

Headwall and Wingwall Details



Section A-A (see page 72)

Typical Headwall Elevation



Plan View

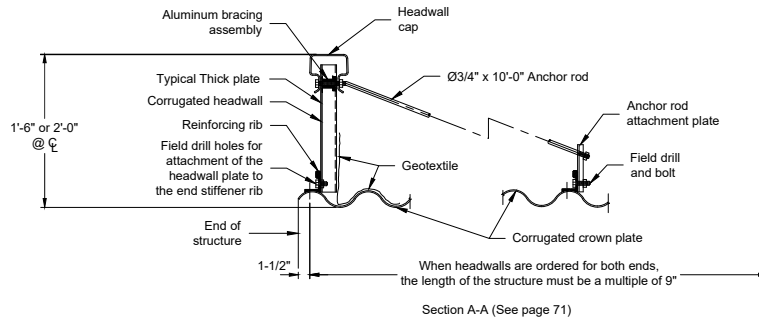
Notes:

1. All panels are fabricated from aluminum structural plate as specified in ASTM B746.
2. Height of headwall listed in Table 50B permits approximately 24" entrenchment depth below the invert. All wingwall and headwall end panels must be trenched into existing ground.
3. Horizontal rotation on the wingwall should not exceed 90°.
4. The top of a headwall and its wingwall are always horizontal, unless beveled wingwalls are required.
5. Standard headwalls shown are for vertical orientation only.
6. If side slope is flatter than 2:1, a double tieback assembly is required for each deadman.
7. Standard headwalls are shown. HS-20, HS-25 and HL-93 wheel loads must be kept a minimum distance of 36" from the wall face. Special headwall packages can be fabricated to meet other loading requirements.
8. For details on single and dual deadman anchors, refer to next page.
9. Structures on concrete footings with headwalls require field modification of the headwall plates to fit around the footings.
10. Aluminum headwalls may be used only on square-ended structures. Structure length must be an increment of 9 inches, if these headwalls are utilized at both ends.

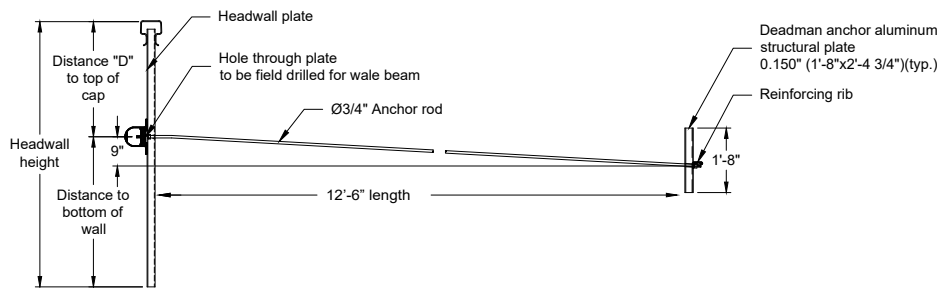
Wall Height	Headwall			Wingwalls						0.150" thick Deadman Size	3/4" Dia. Rod Length
				Side Anchor		Dual Anchor		Triple Anchors			
	Center Panel Thickness	End Panel Thickness	Wale Beam - Distance from top to HW	Panel Thickness	Wale Beam - Distance from top of HW	Panel Thickness	Wale Beam - Distance from top of HW	Panel Thickness	Wale Beam - Distance from top of HW		
6' 2" to 8' 7"	0.125"	0.150"	N/A	0.125"	3' 0"	0.125"	2' 6"	N/A	N/A	1'8" x 2' 4 3/4"	12' 6"
9' 4" to 11' 9"	0.125"	0.150"	N/A	0.150"	3' 6"	0.125"	3' 0"	N/A	N/A	1'8" x 2' 4 3/4"	12' 6"
12' 7" to 14' 2"	0.125"	0.150"	N/A	N/A	N/A	0.150"	3' 6"	N/A	N/A	1'8" x 2' 4 3/4"	12' 6"
14' 11"	0.175"	0.175"	7' 3" & 12' 3"	N/A	N/A	N/A	N/A	0.175"	4'6", 9'3", 12'9"	3'2" x 2' 5 1/2"	19' 0"
15' 9"	0.175"	0.175"	7' 6" & 12' 8"	N/A	N/A	N/A	N/A	0.175"	4'6", 9'3", 12'9"	3'2" x 2' 5 1/2"	19' 0"
16' 7"	0.200"	0.200"	7' 6", 12' 8", & 14' 0"	N/A	N/A	N/A	N/A	0.200"	4'9", 9'9", 13'8"	3'2" x 2' 5 1/2"	19' 0"
17' 4"	0.200"	0.200"	7' 6", 12' 8", & 15' 0"	N/A	N/A	N/A	N/A	0.200"	4'6", 9'9", 13'8"	3'2" x 2' 5 1/2"	19' 0"

ANYTHING GREATER THAN 17'4": INQUIRE

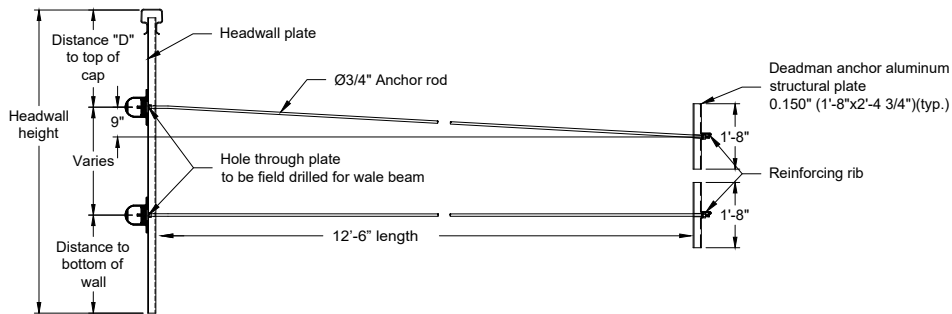
HEADWALL ATTACHMENT TO CROWN



SINGLE ANCHOR DESIGN



DUAL ANCHOR DESIGN



Note: Triple anchor design required for 14' 2" and greater heights. See table above for additional options.

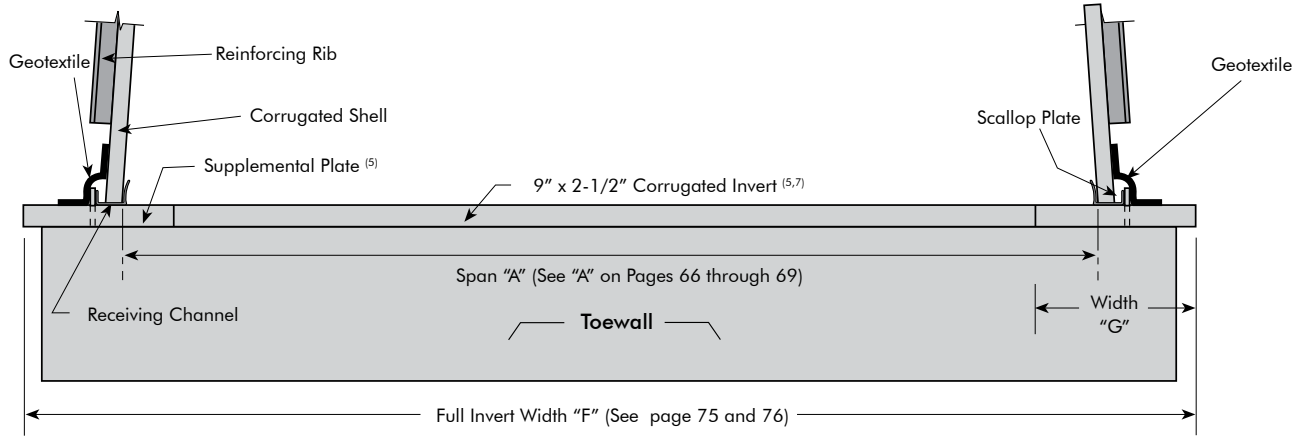
Headwall Dimensions for H-20, HS-20, H-25, HS-25, HL-93 Loading

TABLE 50B. HEADWALL							
No.	Width Ft.-In.	Height Ft.-In.	No. of Anchor Rods	No.	Width Ft.-In.	Height Ft.-In.	No. of Anchor Rods
1	13-6	6-2	3	88	33-0	9-4	7
2	13-6	6-11	3	89	33-0	10-11	7
3	13-6	7-9	3	90	33-0	10-11	7
4	13-6	8-6	3	91	33-0	11-9	7
5	13-6	9-4	3	92	33-0	12-7	7
6	13-6	10-2	3	93	33-0	13-4	7
7	13-6	10-11	3	94	33-0	14-2	7
8	15-0	6-2	3	95	34-6	10-2	8
9	15-0	6-11	3	96	34-6	10-11	8
10	15-0	7-9	3	97	34-6	11-9	8
11	15-0	8-6	3	98	34-6	12-7	8
12	15-0	9-4	3	99	34-6	13-4	8
13	15-0	10-2	3	100	34-6	14-2	8
14	15-0	10-11	3	101	34-6	14-11	8
15	16-6	6-11	4	102	36-0	10-11	8
16	16-6	7-9	4	103	36-0	11-9	8
17	16-6	8-6	4	104	36-0	12-7	8
18	16-6	9-4	4	105	36-0	13-4	8
19	16-6	10-2	4	106	36-0	13-4	8
20	16-6	10-11	4	107	36-0	14-2	8
21	18-0	6-11	4	108	36-0	14-11	8
22	18-0	7-9	4	109	37-6	10-11	8
23	18-0	8-6	4	110	37-6	11-9	8
24	18-0	9-4	4	111	37-6	12-7	8
25	18-0	10-2	4	112	37-6	13-4	8
26	19-6	6-11	4	113	37-6	14-2	8
27	19-6	7-9	4	114	37-6	14-11	8
28	19-6	8-6	4	115	37-6	15-9	8
29	19-6	9-4	4	116	37-6	11-9	8
30	19-6	10-2	4	117	37-6	12-7	8
31	19-6	10-11	4	118	37-6	13-4	8
32	19-6	11-9	4	119	37-6	14-2	8
33	21-0	6-11	5	120	37-6	14-11	8
34	21-0	7-9	5	121	37-6	15-9	8
35	21-0	8-6	5	122	37-6	16-7	8
36	21-0	9-4	5	123	37-6	11-9	8
37	21-0	10-2	5	124	37-6	12-7	8
38	21-0	10-11	5	125	37-6	13-4	8
39	21-0	11-9	5	126	37-6	14-2	8
40	22-6	7-9	5	127	37-6	14-11	8
41	22-6	8-6	5	128	37-6	15-9	8
42	22-6	9-4	5	129	37-6	16-7	8
43	22-6	10-2	5	130	40-6	12-7	9
44	22-6	10-11	5	131	40-6	13-4	9
45	22-6	11-9	5	132	40-6	14-2	9
46	22-6	12-7	5	133	40-6	14-11	9
47	24-0	8-6	5	134	40-6	15-9	9
48	24-0	9-4	5	135	40-6	16-7	9
49	24-0	10-2	5	136	40-6	17-4	9
50	24-0	10-11	5	137	42-0	13-4	9
51	24-0	11-9	5	138	42-0	14-2	9
52	24-0	12-7	5	139	42-0	14-11	9
53	24-0	13-4	5	140	42-0	15-9	9
54	25-6	8-6	6	141	42-0	16-7	9
55	25-6	9-4	6	142	42-0	17-4	9
56	25-6	10-2	6	143	42-0	18-2	9
57	25-6	10-11	6				
58	25-6	11-9	6				
59	25-6	12-7	6				
60	25-6	13-4	6				
61	27-0	9-4	6				
62	27-0	10-2	6				
63	27-0	10-11	6				
64	27-0	11-9	6				
65	27-0	12-7	6				
66	27-0	13-4	6				
67	27-0	14-2	6				
68	28-6	9-4	6				
69	28-6	10-2	6				
70	28-6	10-11	6				
71	28-6	11-9	6				
72	28-6	12-7	6				
73	28-6	13-4	6				
74	28-6	14-2	6				
75	30-0	10-2	7				
76	30-0	10-11	7				
77	30-0	11-9	7				
78	30-0	12-7	7				
79	30-0	13-4	7				
80	30-0	14-2	7				
81	30-0	14-11	7				
82	31-6	10-2	7				
83	31-6	10-11	7				
84	31-6	11-9	7				
85	31-6	12-7	7				
86	31-6	13-4	7				
87	31-6	14-2	7				



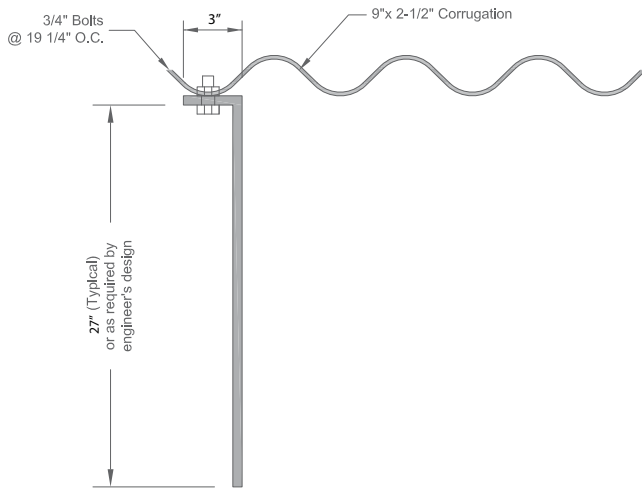
Aluminum Box Culvert with Full Aluminum Headwall Package

Aluminum Box Culvert



Aluminum Full Invert Option (2,3,5,6)

Note: Flat sheet toewalls are available only for structures having a full corrugated aluminum invert.



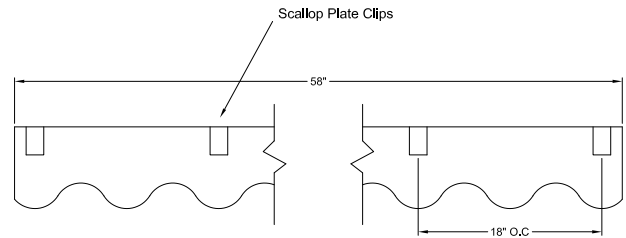
Aluminum Bent Sheet Toewall Detail

Notes:

1. $N=9.625$ \" or $9 \frac{5}{8}$ \". Use N as a conversion factor. For example, for Structure No. 1, Width \"F\" is $13 \times N$, or 125.13\".
2. Minimum allowable (unfactored) soil-bearing pressure is 4,000 Lbs./Sq. Ft. for structures and details shown in this catalog. This applies specifically for width \"G\" below the receiving channel. Other conditions can be accommodated. Contact a Contech Representative for more information.
3. The maximum cover for Aluminum Box Culverts with full inverts and footing pads should not exceed 4 feet. Special full invert and footing pad designs or slotted concrete footings can accommodate maximum covers to the limits shown in Tables 48A-48B and 49A-49B.
4. Weight per foot of full invert includes receiving channels, scallop plates, nuts, bolts, and all plates.
5. Full invert plates thickness are as shown. When reactions to the invert require additional thickness, supplemental plates of the thickness and width listed in Table 51 are furnished to bolt between the full invert and the receiving channel.
6. Invert widths 21N and greater are two-pieces.
7. Invert plates must not be overlapped on adjacent structures unless appropriate design modifications are incorporated.



Installation of Aluminum Box Culvert Toewall



**Aluminum Scallop Plate
(Full Invert Only)**

Invert Details

TABLE 51A FULL INVERT (H-20, HS-20)					
Structure No.	Width "F" (N)	Supplemental Plate Thickness (Inches)	Width "G" (N)	Weight/Ft. (Lbs.)	Bolts/Ft. (Each)
1	13		2	26.1	5.78
2	14		2	27.6	6.00
3	14		2	27.6	6.00
4	15		2	29.1	6.22
5	16		2	30.5	6.44
6	16		2	30.5	6.44
7	17		2	32.0	6.67
8	15		2	29.1	6.22
9	16		2	30.5	6.44
10	16		2	30.5	6.44
11	17		2	32.0	6.67
12	17		2	32.0	6.67
13	18		2	33.5	6.89
14	18		2	33.5	6.89
15	17		2	32.0	6.67
16	17		2	32.0	6.67
17	18		2	33.5	6.89
18	18		2	33.5	6.89
19	19		2	35.0	7.11
20	19		2	35.0	7.11
21	19		2	35.0	7.11
22	19		2	35.0	7.11
23	19		2	35.0	7.11
24	20		2	37.9	10.00
25	20		2	37.9	10.00
26	20	.100	2	43.7	10.22
27	21	.100	2	45.2	10.22
28	21	.100	2	45.2	10.22
29	21	.100	2	45.2	10.22
30	22	.100	2	46.7	10.44
31	22	.100	2	46.7	10.44
32	22	.100	2	46.7	10.44
33	22	.100	2	46.7	10.44
34	22	.100	2	46.7	10.44
35	23	.100	2	48.2	10.67
36	23	.100	2	48.2	10.67
37	23	.100	2	48.2	10.67
38	23	.100	2	48.2	10.67
39	24	.100	2	49.7	10.67
40	26	.100	3	55.2	11.33
41	26	.100	3	55.2	11.33
42	27	.100	3	56.6	11.56
43	27	.100	3	56.6	11.56
44	28	.100	3	58.1	11.78
45	28	.100	3	58.1	11.78
46	29	.100	3	59.6	12.00
47	27	.100	3	56.6	11.56
48	28	.100	3	58.1	11.78
49	28	.100	3	58.1	11.78
50	29	.100	3	59.6	12.00
51	29	.100	3	59.6	12.00
52	29	.125	3	61.5	12.00
53	30	.125	3	63.0	12.22
54	29	.125	3	61.5	12.00
55	29	.125	3	61.5	12.00
56	30	.125	3	63.0	12.22
57	30	.125	3	63.0	12.22
58	30	.125	3	63.0	12.22
59	31	.125	3	64.5	12.44
60	31	.125	3	64.5	12.44
61	30	.125	3	63.0	12.22
62	31	.125	3	64.5	12.44
63	31	.150	3	66.4	12.44
64	31	.150	3	66.4	12.44
65	32	.150	3	67.9	12.67
66	32	.150	3	67.9	12.67
67	32	.150	3	67.9	12.67
68	32	.150	3	67.9	12.67
69	32	.150	3	67.9	12.67
70	32	.150	3	67.9	12.67
71	33	.150	3	69.4	12.89
72	33	.150	3	69.4	12.89
73	33	.150	3	69.4	12.89
74	33	.150	3	69.4	12.89
75	33	.150	3	71.3	12.89
76	34	.175	3	72.8	13.11
77	34	.175	3	72.8	13.11
78	34	.175	3	72.8	13.11
79	34	.175	3	72.8	13.11
80	34	.175	3	72.8	13.11
81	34	.175	3	72.8	13.11
82	35	.200	3.5	78.8	13.33
83	35	.200	3.5	78.8	13.33
84	35	.200	3.5	78.8	13.33
85	36	.200	3.5	80.3	13.56
86	36	.200	3.5	80.3	13.56
87	36	.200	3.5	80.3	13.56

TABLE 51B FULL INVERT (H-25, HS-25, HL-93)					
Structure No.	Width "F" (N)	Supplemental Plate Thickness (Inches)	Width "G" (N)	Weight/Ft. (Lbs.)	Bolts/Ft. (Each)
1	13		2	26.1	5.78
2	14		2	27.6	6.00
3	14		2	27.6	6.00
4	15		2	29.1	6.22
5	16		2	30.5	6.44
6	16		2	30.5	6.44
7	17		2	33.0	6.67
8	15		2	29.8	6.23
9	16		2	30.5	6.44
10	16		2	33.0	6.67
11	17		2	33.0	6.67
12	17		2	33.0	6.67
13	18	.100	2	38.8	6.67
14	18	.100	2	38.8	6.67
15	17	.100	2	38.8	6.67
16	17	.100	2	38.8	6.67
17	18	.100	2	38.8	6.67
18	18	.100	2	42.0	7.11
19	19	.100	2	42.0	7.11
20	19	.100	2	42.0	7.11
21	19	.100	2	42.0	7.11
22	19	.100	2	42.0	7.11
23	19	.100	2	42.0	7.11
24	20	.100	2	46.3	12.45
25	20	.100	2	46.3	12.45
26	20	.100	2	46.3	12.45
27	21	.100	2	47.9	12.67
28	21	.100	2	47.9	12.67
29	21	.100	2	47.9	12.67
30	22	.100	2	47.9	12.67
31	22	.100	2	49.5	12.89
32	22	.100	2	49.5	12.89
33	22	.100	2	49.5	12.89
34	22	.100	2	49.5	12.89
35	23	.100	2	51.1	13.11
36	23	.100	2	51.1	13.11
37	23	.100	2	51.1	13.11
38	23	.100	2	51.1	13.11
39	24	.100	3	55.6	13.34
40	26	.150	3	61.5	13.56
41	26	.150	3	61.5	13.56
42	27	.150	3	63.0	13.78
43	27	.150	3	63.0	13.78
44	28	.150	3	64.9	14.00
45	28	.150	3	64.9	14.00
46	29	.150	3	66.5	14.23
47	27	.150	3	63.0	13.78
48	28	.150	3	64.9	14.00
49	28	.150	3	64.9	14.00
50	29	.150	3	68.0	14.45
51	29	.150	3	68.0	14.45
52	29	.150	3	68.0	14.45
53	30	.175	3	70.0	14.45
54	29	.175	3	68.0	14.45
55	29	.175	3	70.0	14.45
56	30	.175	3	71.9	14.67
57	30	.175	3	71.9	14.67
58	30	.175	3	71.9	14.67
59	31	.175	3	73.4	14.89
60	31	.175	3	73.4	14.89
61	30	.175	3	71.9	14.67
62	31	.175	3	73.4	14.89
63	31	.175	3	73.4	14.89
64	31	.175	3	73.4	14.89
65	32	.175	3	75.0	15.11
66	32	.175	3	75.0	15.11
67	32	.175	3	75.0	15.11
68	32	.175	3	75.0	15.11
69	32	.175	3	75.0	15.11
70	32	.175	3	75.0	15.11
71	33	.175	3	76.6	15.34
72	33	.175	3	76.6	15.34
73	33	.175	3	76.6	15.34
74	33	.175	3	76.6	15.34
75	33	.200	3	78.7	15.34
76	34	.200	3	80.2	15.56
77	34	.200	3	80.2	15.56
78	34	.200	3	80.2	15.56
79	34	.200	3	80.2	15.56
80	34	.200	3	80.2	15.56
81	34	.200	3	80.2	15.56
82	35	.250	3.5	88.5	15.78
83	35	.250	3.5	88.5	15.78
84	35	.250	3.5	88.5	15.78
85	36	.250	3.5	88.5	15.78
86	36	.250	3.5	88.5	15.78
87	36	.250	3.5	88.5	15.78

Notes:

- For structures 1-87, invert plates are 0.100" thick.

TABLE 51C. FULL INVERT (H-25, HS-25, HL-93)

Structure No.	Invert Plate Thickness (Inches)	Invert Width (N)	Supplemental Plate Thickness (Inches)	Supplemental Plate Quantity	Supplemental Plate Width (N)	Weight/Foot (Lbs.)
88	0.125	37	0.175	2	4	113
89	0.125	38	0.175	2	4	115
90	0.125	38	0.175	2	4	115
91	0.125	39	0.175	2	4	117
92	0.125	40	0.175	2	4	119
93	0.125	40	0.175	2	4	119
94	0.125	40	0.175	2	4	119
95	0.125	39	0.175	2	4	119
96	0.125	39	0.175	2	4	119
97	0.125	40	0.175	2	4	119
98	0.125	40	0.175	2	4	119
99	0.125	41	0.175	2	4	120
100	0.125	41	0.175	2	4	120
101	0.125	42	0.250	2	6	165
102	0.125	40	0.250	2	6	161
103	0.125	41	0.250	2	6	163
104	0.125	41	0.250	2	6	163
105	0.125	42	0.250	2	6	165
106	0.125	44	0.250	2	6	168
107	0.125	45	0.250	2	6	170
108	0.125	45	0.250	2	6	170
109	0.125	44	0.250	2	6	170
110	0.125	44	0.250	2	6	170
111	0.125	45	0.250	2	6	170
112	0.125	45	0.250	2	6	170
113	0.125	45	0.250	2	6	170
114	0.125	46	0.250	2	6	172
115	0.125	46	0.250	2	6	172
116	0.125	45	0.250	2	6	172
117	0.125	46	0.250	2	6	172
118	0.125	46	0.250	2	6	172
119	0.125	46	0.250	2	6	172
120	0.125	47	0.250	2	6	174
121	0.125	47	0.250	2	6	174
122	0.125	47	0.250	3	6	214
123	0.125	47	0.250	3	6	214
124	0.125	47	0.250	3	6	214
125	0.125	47	0.250	3	6	214
126	0.125	48	0.250	3	6	216
127	0.125	48	0.250	3	6	216
128	0.125	48	0.250	3	6	216
129	0.125	48	0.250	3	6	216
130	0.125	48	0.250	3	6	216
131	0.125	48	0.250	3	6	216
132	0.125	49	0.250	3	6	217
133	0.125	49	0.250	3	6	217
134	0.125	49	0.250	3	6	217
135	0.125	49	0.250	3	6	217
136	0.125	49	0.250	3	6	217
137	0.125	49	0.250	3	6	217
138	0.125	50	0.250	3	6	219
139	0.125	50	0.250	3	6	219
140	0.125	50	0.250	3	6	219
141	0.125	50	0.250	3	6	219
142	0.125	50	0.250	3	6	219
143	0.125	50	0.250	3	6	219

Aluminum Box Culvert



Assembly of ALBC Shell onto Full Invert

TABLE 52A. FOOTING PADS

Structure No.	H-20, HS-20 Loading		H-25, HS-25, HL-93 Loading		Weight/Ft. (Lbs.)
	Plate Thickness (Inches)	Width "G"(N)	Plate Thickness (Inches)	Width "G" (N)	
1	.100	2	.100	2	11.9
2	.100	2	.100	2	11.9
3	.100	2	.100	2	11.9
4	.100	2	.100	2	11.9
5	.100	2	.100	2	11.9
6	.100	2	.100	2	11.9
7	.100	2	.100	2	11.9
8	.100	2	.100	2	11.9
9	.100	2	.100	2	11.9
10	.100	2	.100	2	11.9
11	.100	2	.100	2	11.9
12	.100	2	.100	2	11.9
13	.100	2	.125	2	11.9
14	.100	2	.125	2	11.9
15	.100	2	.125	2	11.9
16	.100	2	.125	2	11.9
17	.100	2	.125	2	11.9
18	.100	2	.125	2	11.9
19	.100	2	.125	2	11.9
20	.100	2	.125	2	11.9
21	.100	2	.125	2	11.9
22	.100	2	.125	2	11.9
23	.100	2	.125	2	11.9
24	.100	2	.125	2	11.9
25	.100	2	.125	2	11.9
26	.125	2	.150	2	13.2
27	.125	2	.150	2	13.2
28	.125	2	.150	2	13.2
29	.125	2	.150	2	13.2
30	.125	2	.150	2	13.2
31	.125	2	.150	2	13.2
32	.125	2	.150	2	13.2
33	.125	2	.150	2	13.2
34	.125	2	.150	2	13.2
35	.125	2	.150	2	13.2
36	.125	2	.150	2	13.2
37	.125	2	.150	2	13.2
38	.125	2	.150	2	13.2
39	.125	2	.200	3	22.2
40	.200	3	.250	3	22.2
41	.200	3	.250	3	22.2
42	.200	3	.250	3	22.2
43	.200	3	.250	3	22.2
44	.200	3	.250	3	22.2
45	.200	3	.250	3	22.2
46	.200	3	.250	3	22.2
47	.200	3	.250	3	22.2
48	.200	3	.250	3	22.2
49	.200	3	.250	3	22.2
50	.200	3	.250	3	22.2
51	.200	3	.250	3	22.2
52	.225	3	.250	3	24.1
53	.225	3	.275	3	24.1
54	.225	3	.275	3	24.1
55	.225	3	.275	3	24.1
56	.225	3	.275	3	24.1
57	.225	3	.275	3	24.1
58	.225	3	.275	3	24.1
59	.225	3	.275	3	24.1
60	.225	3	.275	3	24.1
61	.225	3	.275	3	24.1
62	.225	3	.275	3	24.1
63	.250	3	.275	3	26.0
64	.250	3	.275	3	26.0
65	.250	3	.275	3	26.0
66	.250	3	.275	3	26.0
67	.250	3	.275	3	26.0
68	.250	3	.275	3	26.0
69	.250	3	.275	3	26.0
70	.250	3	.275	3	26.0
71	.250	3	.275	3	26.0
72	.250	3	.275	3	26.0
73	.250	3	.275	3	26.0
74	.250	3	.275	3	26.0
75	.275	3	.300	3.5	28.0
76	.275	3	.300	3.5	28.0
77	.275	3	.300	3.5	28.0
78	.275	3	.300	3.5	28.0
79	.275	3	.300	3.5	28.0
80	.275	3	.300	3.5	28.0
81	.275	3	.300	3.5	28.0
82	.300	3.5	.350	3.5	33.8
83	.300	3.5	.350	3.5	33.8
84	.300	3.5	.350	3.5	33.8
85	.300	3.5	.350	3.5	33.8
86	.300	3.5	.350	3.5	33.8
87	.300	3.5	.350	3.5	33.8

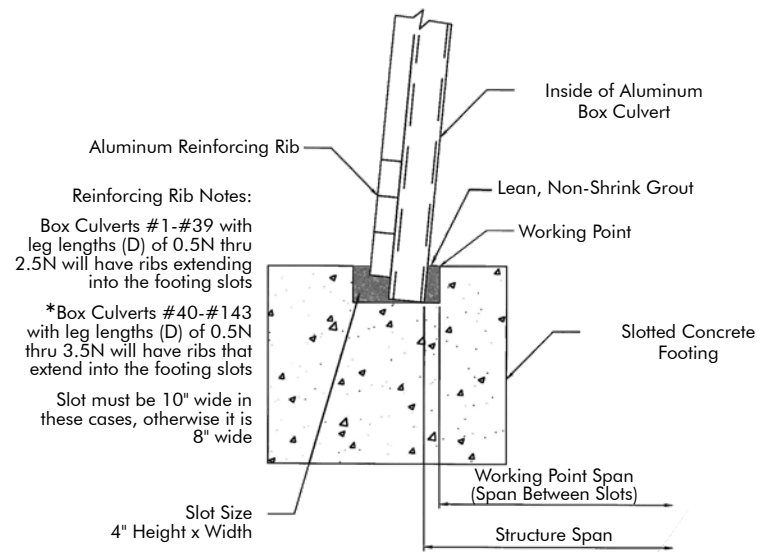
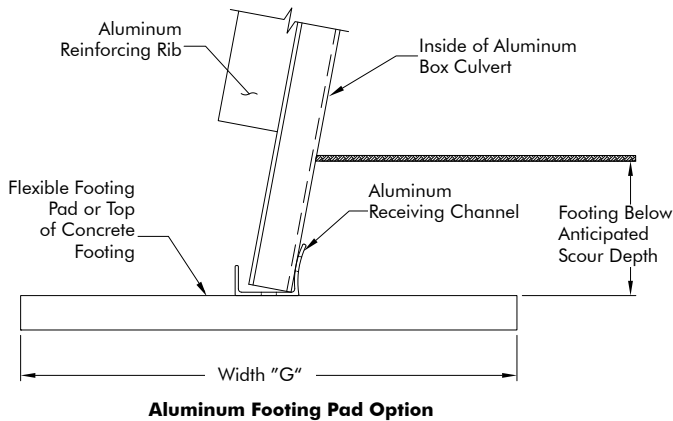
TABLE 52B. FOOTING PADS (HL-93)

Structure No.	Total Thickness (Inches)	Plate Thickness		Width "G" (N)	Weight/Foot (Lbs.)
		Quantity	(Inches)		
88	0.500	2	0.250	4	53
89	0.500	2	0.250	4	53
90	0.500	2	0.250	4	53
91	0.500	2	0.250	4	53
92	0.500	2	0.250	4	53
93	0.500	2	0.250	4	53
94	0.500	2	0.250	4	53
95	0.500	2	0.250	4	53
96	0.500	2	0.250	4	53
97	0.500	2	0.250	4	53
98	0.500	2	0.250	4	53
99	0.500	2	0.250	4	53
100	0.500	2	0.250	4	53
101	0.600	3	0.200	6	96
102	0.600	3	0.200	6	96
103	0.600	3	0.200	6	96
104	0.600	3	0.200	6	96
105	0.600	3	0.200	6	96
106	0.600	3	0.200	6	96
107	0.600	3	0.200	6	96
108	0.600	3	0.200	6	96
109	0.600	3	0.200	6	96
110	0.600	3	0.200	6	96
111	0.600	3	0.200	6	96
112	0.600	3	0.200	6	96
113	0.600	3	0.200	6	96
114	0.600	3	0.200	6	96
115	0.600	3	0.200	6	96
116	0.600	3	0.200	6	96
117	0.600	3	0.200	6	96
118	0.600	3	0.200	6	96
119	0.600	3	0.200	6	96
120	0.600	3	0.200	6	96
121	0.600	3	0.200	6	96
122	0.900	4	0.225	6	144
123	0.900	4	0.225	6	144
124	0.900	4	0.225	6	144
125	0.900	4	0.225	6	144
126	0.900	4	0.225	6	144
127	0.900	4	0.225	6	144
128	0.900	4	0.225	6	144
129	0.900	4	0.225	6	144
130	0.900	4	0.225	6	144
131	0.900	4	0.225	6	144
132	0.900	4	0.225	6	144
133	0.900	4	0.225	6	144
134	0.900	4	0.225	6	144
135	0.900	4	0.225	6	144
136	0.900	4	0.225	6	144
137	0.900	4	0.225	6	144
138	0.900	4	0.225	6	144
139	0.900	4	0.225	6	144
140	0.900	4	0.225	6	144
141	0.900	4	0.225	6	144
142	0.900	4	0.225	6	144
143	0.900	4	0.225	6	144

Notes:

1. N=9.625". Use N as a conversion factor. For example, for Structure No. 1, Width "G" is 2 x N, or 19.25".
2. Minimum allowable (unfactored) soil-bearing pressure is 4,000 Lbs./Sq. Ft. for structures and details shown in this catalog. This applies specifically for width "G" below the footing pad. Other conditions can be accommodated. Contact a Contech representative for more information.
3. The maximum cover for Aluminum Box Culverts with full inverts and footing pads should not exceed 4 feet. Special full invert and footing pad designs or slotted concrete footings can accommodate maximum covers to the limits shown in Tables 48A-48B and 49A-49B.
4. Weight per foot of footing pads includes receiving channels, nuts, bolts, and plates.
5. When the thickness listed is greater than .250", the footing pads will be two or more pieces equaling the composite thickness required.
6. Footing pads must not be overlapped on adjacent structures unless appropriate design modifications are incorporated.

Aluminum Box Culvert



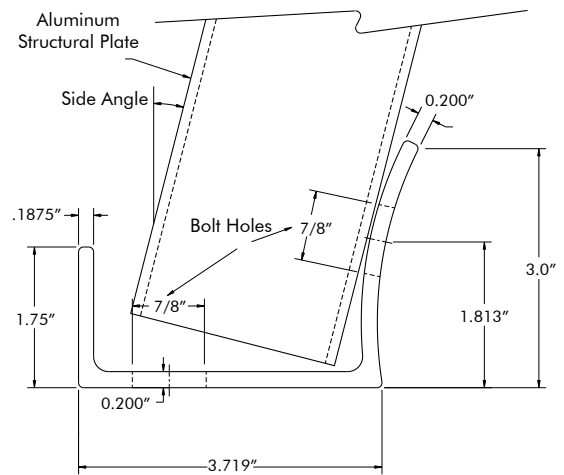
*See note above. For D dimension see page 70.

Scour Considerations

In most cases, using a full aluminum invert with toe plate extensions at the inlet and outlet ends will eliminate the potential for scour through the structure. If it is desirable to span the stream crossing, scour should be investigated. The most efficient counter measure, as listed below, should be chosen based on site specific conditions. The selected alternative should be designed by the registered professional engineer for the project.

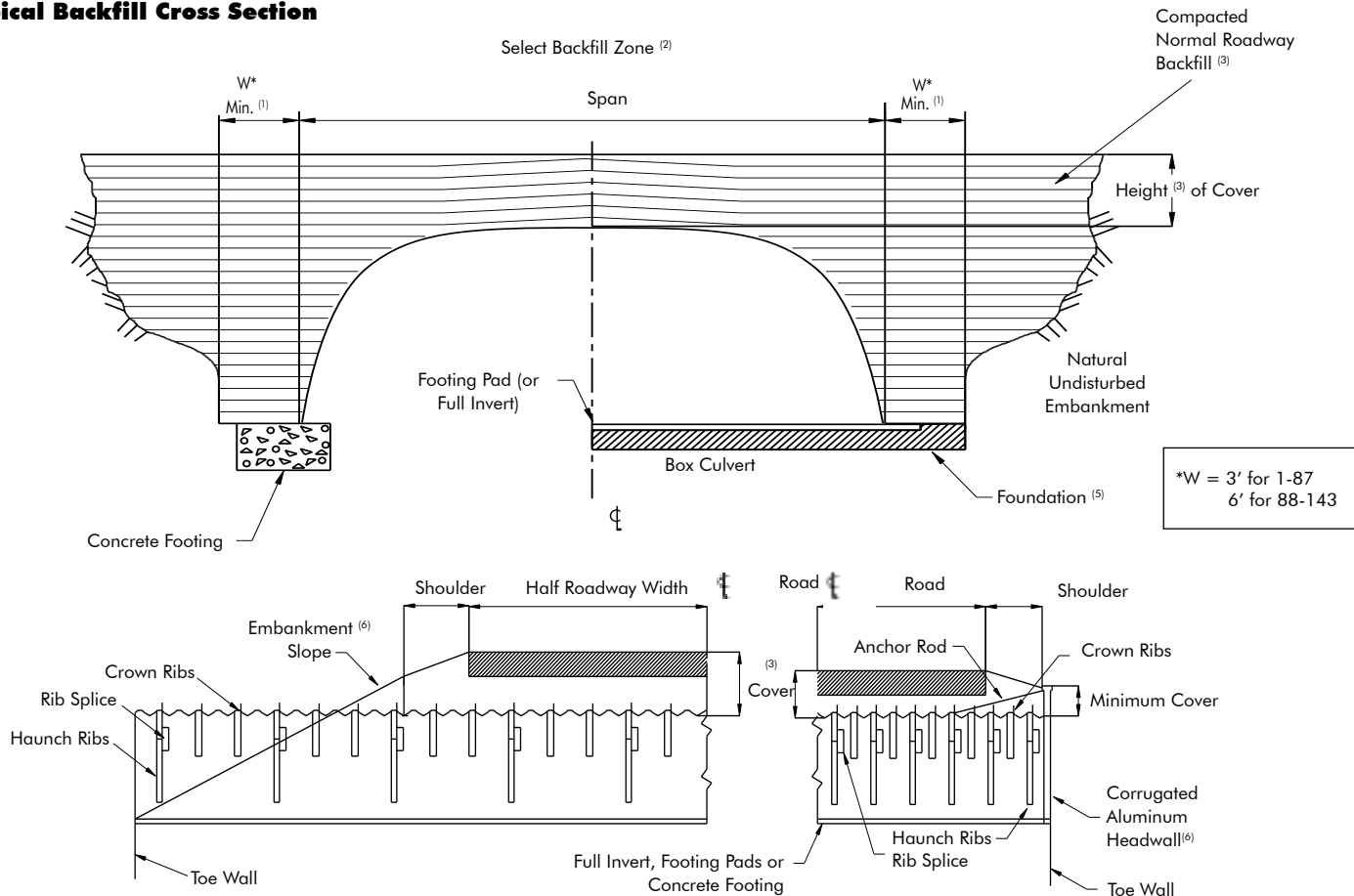
These counter measures include:

- Rip rap protection
- Concrete paving
- Lower footings below anticipated scour depth
- Bearing foundation on competent rock
- Undercut erodible soils and replace with non-erodible material
- Construction of guide banks including sheet piling
- Implementation of permanent erosion control mats where vegetation can be established, such as Pyramat®
- Implementation of hard armor interlocking blocks where vegetation cannot be established, such as ArmorFlex® or A-Jacks®



Please contact your Contech representative for more details and design information.

Typical Backfill Cross Section



Typical End Treatments

Notes:

1. If W is less than the required width, a concrete grout material may be required as backfill.
2. Backfill to be well graded granular, A-1, A-2-4, A-2-5, or A-3 for box culverts #1 through #87. For box culverts #88 through #143, A-1, A-2-4, A-2-5 backfill material should be used, per AASHTO M 145, placed in six- to eight-inch lifts symmetrically on each side compacted to minimum 90% density per AASHTO T 180. D4 dozer or smaller to operate near and above structure during backfilling to finish grade. Refer to AASHTO Sec. 26 installation specification.
3. Fill in these zones, must be placed in 8" maximum lifts and compacted to minimum 90% density per AASHTO T 180.
4. Minimum cover may need to be increased to handle temporary construction vehicle loads (larger than D4) but not to exceed maximum allowable cover for the specific box culvert design.
5. When using a full invert or footing pads, the foundation shall have a minimum of 4,000 psf bearing capacity and include a 6" stable well graded granular bed. Lower bearing capacities can be accommodated through special design or the use of concrete footings.
6. Standard aluminum headwalls shown are for vertical orientation only.
7. The type and extent of end treatment on the box culvert should be chosen and designed so as to prevent the loss of backfill due to high flow conditions.
8. Bolt torque requirements - plate lap must be properly mated in a tangent fashion using proper alignment techniques and adequate bolt torque to seat the corrugation. The recommended installation bolt torque for Aluminum Box Culverts is 90 – 115 ft-lbs for full inverts and 115 – 135 ft-lbs for all other components.
9. For assembly information, see the manufacturer's detailed assembly drawings and instructions.

Aluminum Box Culvert Specification

Scope

This specification covers the manufacture and installation of the aluminum box culvert structure detailed in the plans.

Material

The aluminum box culvert shall consist of plates, ribs, and appurtenant items as shown on the plans and shall conform to the requirements of ASTM B864 and AASHTO M 219. Plate thicknesses, rib spacings, end treatment, and type of invert and foundation shall be as indicated on the plans.

Bolts and nuts shall conform to the requirements of ASTM A307 or ASTM A449 and shall be galvanized in accordance with ASTM A153.

Assembly

The box culvert shall be assembled in accordance with the shop drawings provided by the manufacturer and per the manufacturer's recommendations. Bolts shall be tightened using an applied torque between 90 and 135 ft-lbs depending on the location of the bolts in the structure.

Installation

The box culvert shall be installed in accordance with the plans and specifications, the manufacturer's recommendations and the AASHTO Standard Specification for Highway Bridges, Section 26 (Division II).

Bedding

The bedding should be constructed to a uniform line and grade using material outlined in the backfill section. The foundation must be capable of providing a bearing capacity of at least two tons per square foot.

Backfill

The structure shall be backfilled using clean, well graded granular material that meets the requirements of AASHTO M 145 for soil classifications. A-1, A-2-4, A-2-5, or A-3 for box culverts #1 through #87. For box culverts #88 through #143, A-1, A-2-4, A-2-5 backfill material should be used. Backfill must be placed symmetrically on each side of the structure in 8-inch uncompacted lifts. Each lift shall be compacted to a minimum of 90 percent density per AASHTO T 180.

