

Aluminum Box Culvert Assembly & Installation Guide





Aluminum Box Culvert Assembly & Installation Guide

Table of Contents

Introduction	2
Materials	3
Foundations	4
Aluminum Box Culvert Shell (plates)	8
Toe Walls	8
Scallop Plates	9
Headwalls / Wingwalls	9
Assembly	12
Heavy Load Considerations	13
Backfill Sequence	14
Appendices	15
Appendix A - Typical Backfill Cross Section	15
Appendix B - Loads and Bracing Concept	16
Appendix C - Lifting Detail	17
Appendix D - Rib Assembly Socket	18
Appendix E - Footing Details	18
Appendix F - Lifting Shackle Detail	19
Appendix G - Scallop Detail	19
Appendix H - Geotextile with Scallop Detail	19

Note to Contractor:

If at any time you should experience difficulty fitting the structure together, please don't hesitate to call the Winchester Plant Technical Services Team at 859-744-3339 for assistance.

General

The following is a guideline. Other procedures and field experience may yield better results. Prior to assembly, review the Structural Plate Design Guide, this guide, the assembly drawings and the engineer's plans and specifications.

For each different structure shipped to the jobsite, the structural plate load slip and these instructions are furnished.

Water forces including unexpected flooding may damage components or cause flotation of the structure. The contractor should secure the upstream end and complete backfilling as soon as possible.

Suggested Tool List

- ☑ Hard hat, safety glasses, gloves, hearing protection and steel toed boots
- ☑ Two (2) 2x4 timbers with length equal to width of invert
- ☑ Ladders / scaffolding as needed
- ☑ Air compressor, impact wrench, spud wrench, spud bar, sledgehammer, drill
- ☑ 7/8" reamer bit and rib socket (provided by Contech)

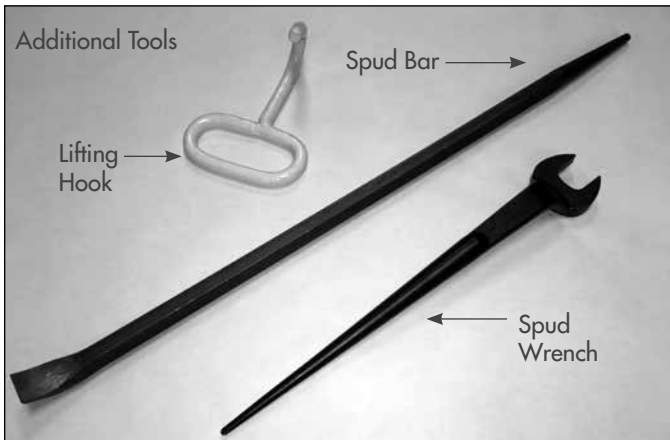
Review the list of tools required above. The special rib assembly socket is required for rib installation. See Appendix D "Rib Assembly Socket" details.



Rib Socket



7/8" Reamer Bit



Additional Tools

Spud Bar

Lifting Hook

Spud Wrench

Special Assembly Considerations

1. Should the holes in the corrugation begin to shift off center, start in the middle of the circumferential seam and work one bolt at a time, proceeding in both directions towards the end of the plate. If you tighten the plate on the longitudinal seam first, all flexibility of the assembly is lost.
2. Should you encounter unpunched or mispunched holes, merely field drill another 7/8" diameter hole. Reference "Aluminum Structural Plate – Plate Markings & Details" on page 5 for proper hole position and spacing.



Crew Size

Crew size can vary from three to six persons. A four-person crew is generally the most efficient. Five and six-person crews are generally used only when time is a critical factor in assembling the structure. A three-person crew is usually less efficient since work is more easily done in pairs.

Description of Materials

One of the bolt containers accompanying each shipment is specially marked. It contains the Bill of Material and the Aluminum Box Culvert Assembly & Installation Guide and the Plate Assembly Drawing.



Plates

All plates and ribs are shipped to the jobsite pre-punched and curved in strapped, nested bundles. Each bundle will contain only plates or ribs having the same curvature. The maximum weight per bundle generally will not exceed 5,000 pounds. Therefore, unloading plate and rib bundles off the truck should be planned accordingly. If the bundles are improperly unloaded, such as pushed off the truck; the plates may be damaged and/or difficult to separate. Damaged plates may cause unnecessary work for the assembly crew.

The structural plates for aluminum structures are furnished in 4.5' net widths. Plate net lengths (running around the circumference of the structure) are 8N through 19N in intervals of 1 N, where $N = 9.625"$. This equals the spacing between circumferential bolt holes.

All cut plates or otherwise altered plates (such as plates with hook bolt holes) will have mark numbers painted on the outside surface of the plate. If the cut plates are too narrow, a wired tag will contain the required stencil data. The plate numbers will coincide with mark numbers shown on the assembly drawing.

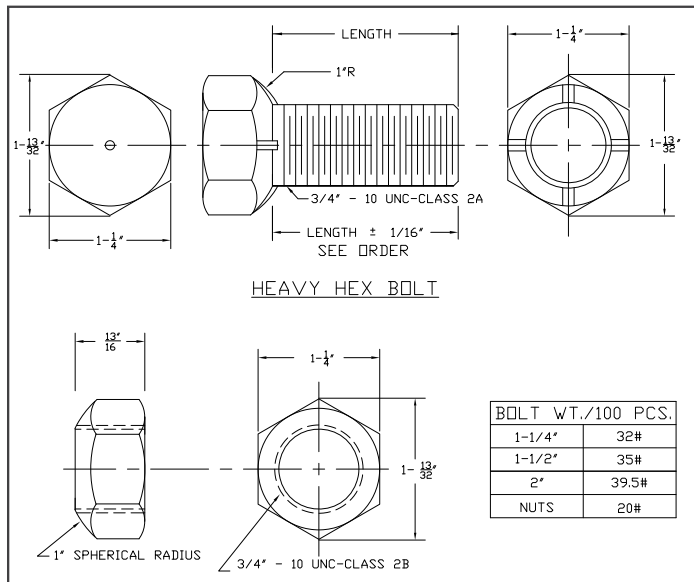
Reinforcing Ribs

All rib bundles are marked with numbers corresponding to the assembly drawing. Follow the assembly drawing in placing a specific rib in its proper place on the structure. There are left hand and right hand haunch reinforcing ribs. The invert corners of the haunch reinforcing ribs are painted red. The red end goes down toward the receiving channel or keyway. The haunch and crown ribs that are spliced together must be oriented the same. It is usually best to orient all ribs with the horizontal legs pointing upstream.



Reinforcing ribs are furnished for attachment to the outside of the structure. Rib splices are used to fasten together any reinforcing ribs that butt together. Reinforcing ribs are bolted to the structure on 9", 18", 27" or 54" centers, longitudinally, down the structures' length through pre-punched holes in the both the ribs and the structural plate.

Fasteners



Bolts are furnished in four lengths, 1-1/4", 1-1/2", 2" and 2-1/2". To determine the approximate number of bolts for a structure, check the structural plate load slip or consult the Contech Structural Plate Design Guide. All containers are stenciled with the individual bolt size. When multiple structures are shipped together, the materials for each structure are individually color coded.

Plate Layout Drawing / Material Identification

The assembly drawing will have a plan view of the structure showing the outside surface of the structure as if it were laid out flat. The various lengths of plates and special cut plates are assembled or placed in the structure in accordance with the assembly drawing as marked (see Figure 2. Plate Markings & Details). All plates with the same letter are interchangeable and may be placed in any location requiring plates of that letter.

Normally, all of the plates in the barrel of the structure are not shown on the assembly drawing. However, enough plates are shown to establish the proper seam stagger and a repetitive pattern in the barrel. This pattern establishes the correct location of all plates. The plates must be oriented such that their location matches that shown on the assembly drawing. Should it prove impossible to match the plate and the assembly drawing, call the Winchester Plant Technical Services Team at 859-744-3339 for assistance.

There may be cut plates on one or both ends of the structure. There are numbers given to the cut plates for haunch, invert, supplemental plates or footing pads. The numbers for all cut plates are shown on the assembly drawing.

Foundation Types

- ALBC with Footing Pads
- Reinforced Concrete Foundation
 - EXPRESS® Foundations
 - Poured-in-Place
 - Precast
- ALBC with Full Metal Invert

ALBC with Aluminum Footing Pads



General Information

- For some structures using footing pads, straight Type IV stiffener ribs are to be bolted, 12" above the footing pad on each side for the length of the structure. See the assembly drawings for detailed information.
- The footing pad plates will have letter designations following the letters of the shell plates.
- Scallop plates are not required on structures with footing pads since it is assumed that they will be buried below the finished grade to prevent scour.

Assembly Procedure

1. Footing pads are corrugated plates to which receiving channels are attached. Lay out the footing pad plates as shown on the assembly drawings. Space the two runs of footing pad plates apart so that their center-to-center spacing is equal to the span of the structure plus 3.5".
2. Start with the footing pad plate for one end as shown on assembly drawing. Bolt the next full footing pad plate. Continue to bolt the footing pad plates together until 5 sections (22.5') are loose bolted on both sides.
3. Use drift pins to help align the bolt holes. Bolts should be placed from the bottom to allow for torquing the nuts once all of the receiving channels are attached. Care must be taken to maintain the 18" hole spacing by using drift pins to pull the footer pad holes in alignment with receiving channel holes. And, care must be taken to insure that neither the left side nor the right side are running ahead of the other.
4. After the receiving channels are attached, tighten the footing pad bolts with 90-115 ft.-lb. of torque and tighten the receiving channel with 115 to 135 ft.-lbs. of torque. Proceed in like manner with the next four sections of footing pads (18') and repeat this process until both footing pad runs are assembled on each side of the structure. DO NOT OVER TORQUE.

Figure 1. Sample Plate Layout Drawing

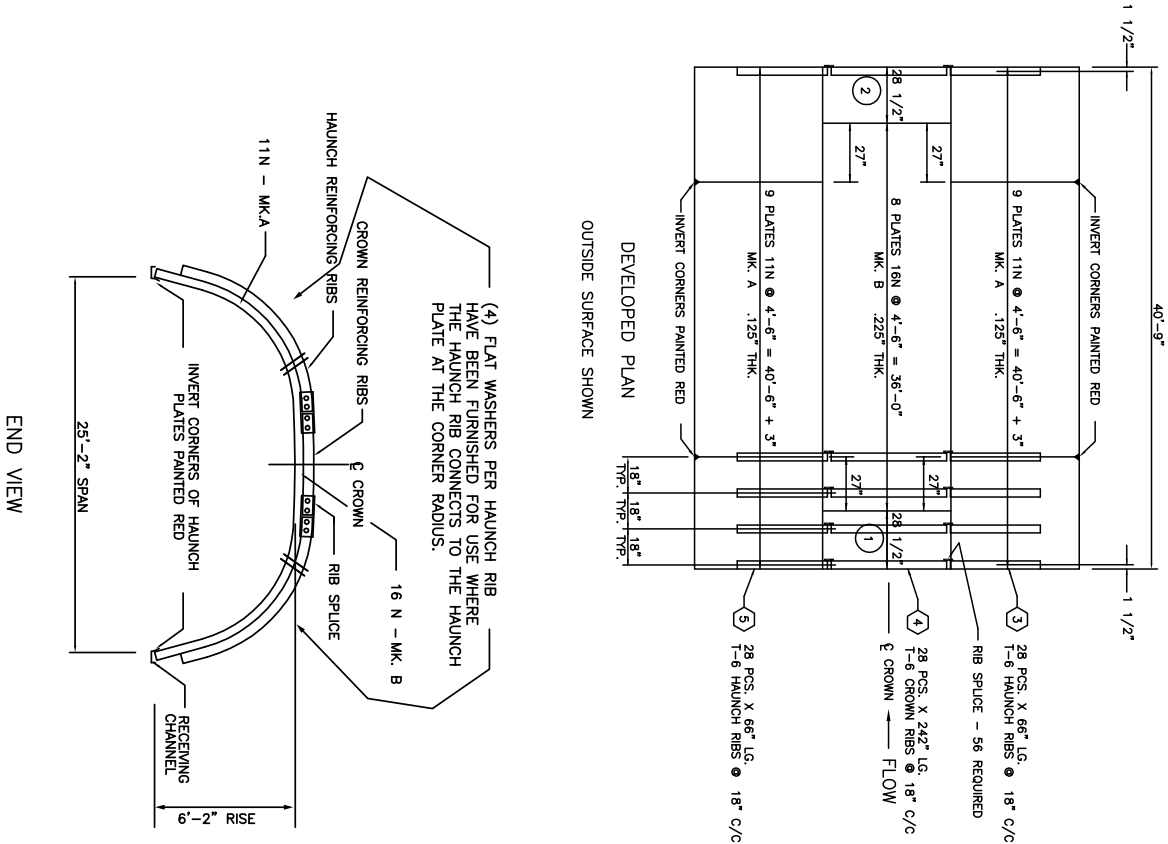


Figure 2. Plate Markings & Details Drawing

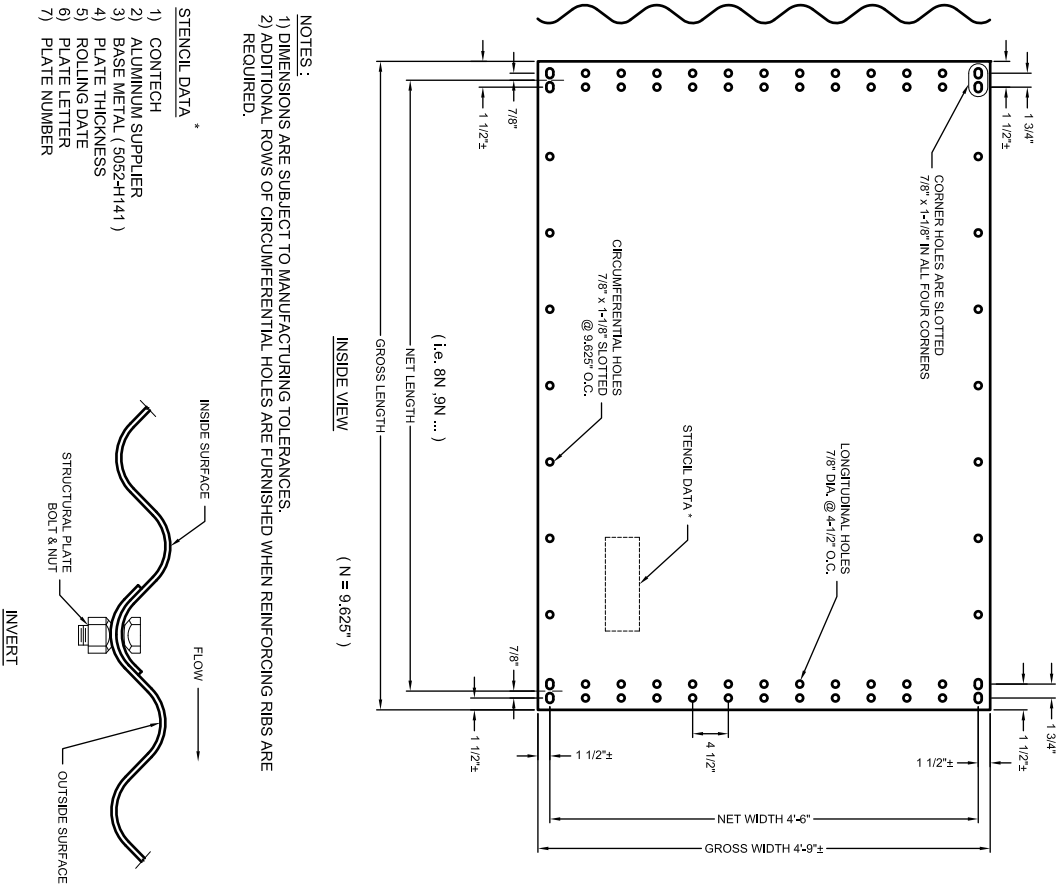


TABLE 1. ALBC STRUCTURE AREA, PLATE AND RIB MAKE-UP

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)			Span	Rise						Haunch (N)	Crown (N)			
1	8'-9"	2'-6"	18.4	5	4	.5	14	14	NA	15.40	75	24'-0"	5'-9"	108.2	27	4	.5	36	10	16	4.30		
2	9'-2"	3'-3"	25.4			1.5	16	8	TWO PLATE SHELL		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			3.5	20	10			78	24'-4"	8'-2"	166.2			3.5	42	13				
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	13.55	82		25'-2"	6'-2"	122.0	.5	38	11	16	2.18						
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	2.5	42	13								
11	11'-4"	5'-0"	48.2	3.5	22	11		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	11.70	88		26'-7"	5'-5"	111.6	29	4	.5	38	11	16	15.22				
16	11'-11"	3'-7"	37.4	1.5	20	10		89		27'-0"	6'-3"	132.4			1.5	40	12						
17	12'-3"	4'-5"	46.9	2.5	22	11		90		27'-5"	7'-0"	153.4			2.5	42	13						
18	12'-7"	5'-2"	56.6	3.5	24	12		91		27'-10"	7'-9"	174.8			3.5	44	14						
19	12'-11"	6'-0"	66.6	4.5	26	13		92		28'-3"	8'-7"	196.5			4.5	46	15						
20	13'-3"	6'-9"	76.9	5.5	28	14		93	28'-8"	9'-4"	218.6	5.5			48	16							
21	13'-0"	3'-0"	33.8	.5	20	10		94	29'-2"	10'-1"	241.0	6.5			50	17							
22	13'-4"	3'-10"	44.2	1.5	22	11	9.87	95	27'-10"	5'-10"	125.4	.5	40	12	16	13.45							
23	13'-7"	4'-7"	54.8	2.5	24	12		96	28'-3"	6'-8"	147.3	1.5	42	13									
24	13'-10"	5'-5"	65.6	3.5	26	13		97	28'-7"	7'-5"	169.4	2.5	44	14									
25	14'-1"	6'-2"	76.6	4.5	28	14		98	29'-0"	8'-3"	191.8	3.5	46	15									
26	14'-5"	3'-3"	40.0	.5	22	11		99	29'-4"	9'-0"	214.6	4.5	48	16									
27	14'-8"	4'-1"	51.5	1.5	24	8		100	29'-8"	9'-9"	237.6	5.5	50	17									
28	14'-10"	4'-10"	63.2	2.5	26	9		8.02	101	30'-1"	10'-7"	260.9	6.5	52			18	18	11.68				
29	15'-1"	5'-8"	75.1	3.5	28	10	102		29'-1"	6'-4"	140.2	.5	42	12									
30	15'-4"	6'-5"	87.2	4.5	30	11	103		29'-5"	7'-1"	163.2	1.5	44	13									
31	15'-6"	7'-3"	99.4	5.5	32	12	104		29'-8"	7'-11"	186.4	2.5	46	14									
32	15'-9"	8'-0"	111.8	6.5	34	13	105		30'-0"	8'-8"	209.8	3.5	48	15									
33	15'-10"	3'-6"	46.8	1.5	26	9	106		30'-4"	9'-5"	233.6	4.5	50	16									
34	16'-0"	4'-3"	59.5	2.5	28	10	107		30'-8"	10'-3"	257.5	5.5	52	17									
35	16'-2"	5'-1"	72.3	3.5	30	11	6.17	108	31'-0"	11'-0"	281.8	6.5	54	18	33	4	18	9.92					
36	16'-4"	5'-11"	85.2	4.5	32	12		109	30'-3"	6'-9"	156.1	.5	44	13									
37	16'-6"	6'-8"	98.3	5.5	34	13		110	30'-6"	7'-7"	180.1	1.5	46	14									
38	16'-8"	7'-6"	111.5	6.5	36	14		111	30'-10"	8'-4"	204.4	2.5	48	15									
39	16'-10"	8'-3"	124.8	.5	26	8		112	31'-1"	9'-2"	228.8	3.5	50	16									
40	17'-9"	3'-10"	54.4	1.5	28	9		113	31'-4"	9'-11"	253.5	4.5	52	17									
41	18'-2"	4'-7"	68.3	2.5	30	10		114	31'-8"	10'-9"	278.4	5.5	54	18									
42	18'-7"	5'-4"	82.5	3.5	32	11	14.90	115	31'-11"	11'-6"	303.5	6.5	56	19	35	4	18	8.15					
43	19'-0"	6'-1"	97.1	4.5	34	12		116	31'-5"	7'-3"	173.1	.5	46	14									
44	19'-5"	6'-11"	111.9	5.5	36	13		117	31'-8"	8'-0"	198.2	1.5	48	15									
45	19'-10"	7'-8"	127.1	6.5	38	14		118	31'-10"	8'-10"	223.4	2.5	50	16									
46	20'-3"	8'-5"	142.6	.5	28	8		119	32'-1"	9'-8"	248.8	3.5	52	17									
47	19'-1"	4'-2"	63.3	1.5	30	9		120	32'-3"	10'-5"	274.4	4.5	54	18									
48	19'-5"	4'-11"	78.3	2.5	32	10		121	32'-7"	11'-3"	300.1	5.5	56	19									
49	19'-9"	5'-8"	93.6	3.5	34	11	12.78	122	32'-8"	12'-0"	326.1	6.5	58	20	37	4	18	6.37					
50	20'-1"	6'-6"	109.2	4.5	36	12		123	32'-7"	7'-9"	191.3	.5	48	14									
51	20'-6"	7'-3"	125.0	5.5	38	13		124	32'-9"	8'-6"	217.3	1.5	50	15									
52	20'-10"	8'-1"	141.2	6.5	40	14		125	32'-11"	9'-4"	243.4	2.5	52	16									
53	21'-2"	8'-10"	157.6	.5	30	8		126	33'-1"	10'-2"	269.7	3.5	54	17									
54	20'-4"	4'-6"	73.1	1.5	32	9		127	33'-3"	10'-11"	296.4	4.5	56	18									
55	20'-7"	5'-3"	89.2	2.5	34	10		128	33'-5"	11'-9"	322.8	5.5	58	19									
56	20'-11"	6'-1"	105.5	3.5	36	11	10.67	129	33'-8"	12'-6"	349.5	6.5	60	20	39	4	20	4.62					
57	21'-3"	6'-10"	122.1	4.5	38	12		130	33'-8"	8'-3"	210.5	.5	50	15									
58	21'-6"	7'-8"	139.0	5.5	40	13		131	33'-9"	9'-1"	237.5	1.5	52	16									
59	21'-10"	8'-5"	156.0	6.5	42	14		132	33'-11"	9'-10"	264.5	2.5	54	17									
60	22'-1"	9'-3"	173.3	.5	32	9		133	34'-0"	10'-8"	291.7	3.5	56	18									
61	21'-7"	4'-11"	83.8	1.5	34	10		134	34'-2"	11'-5"	319.0	4.5	58	19									
62	21'-10"	5'-8"	101.0	2.5	36	11		135	34'-3"	12'-3"	346.4	5.5	60	20									
63	22'-1"	6'-6"	118.4	3.5	38	12	8.53	136	34'-5"	13'-1"	373.8	6.5	62	21	41	4	20	2.85					
64	22'-3"	7'-3"	135.9	4.5	40	13		137	34'-9"	8'-9"	230.9	.5	52	16									
65	22'-6"	8'-1"	153.7	5.5	42	14		138	34'-10"	9'-7"	258.1	1.5	54	17									
66	22'-9"	8'-10"	171.6	6.5	44	15		139	34'-11"	10'-4"	286.7	2.5	56	18									
67	23'-0"	9'-8"	189.8	.5	34	10		140	35'-0"	11'-2"	314.6	3.5	58	19									
68	22'-9"	5'-4"	95.5	1.5	36	11		141	35'-1"	12'-0"	342.7	4.5	60	20									
69	23'-0"	6'-1"	113.7	2.5	38	12		142	35'-2"	12'-9"	370.8	5.5	62	21									
70	23'-2"	6'-11"	132.1	3.5	40	13	14	143	35'-3"	13'-7"	399.0	6.5	64	21	43	4	20	2.85					
71	23'-4"	7'-8"	150.6	4.5	42	14																	
72	23'-6"	8'-6"	169.3	5.5	44	15																	
73	23'-8"	9'-3"	188.1	6.5	46	16																	
74	23'-10"	10'-1"	207.0																				
Notes: 1. Box #1 is a one plate shell.																							

5. Follow steps in the ALBC shell assembly procedure (page 8).
6. Check the bottom span of the structure and make necessary corrections using come-alongs or struts prior to backfilling.

Note: If spreading occurs, use come-alongs and/or struts to maintain the correct span.

ALBC with Concrete Footings



General Information

1. Scallop plates are not required for structures installed in slotted keyway or into receiving channels set on concrete footings.
2. When receiving channels are used they are generally set with anchor bolts into the footings. The anchor bolts are usually set at the time the footings are poured. If the shell is placed all at once into the receiving channels and spreading occurs, use come-alongs and/or struts to maintain the correct span.

Assembly Procedure

The shell of a structure installed into concrete slots, keyways or attached to concrete footings with receiving channels is assembled using the same basic procedure as those with other invert treatments.

ALBC with a Full Metal Invert

Assembly Procedure

Step 1: Preassemble 2-plate invert sections (not required for structures 1-24)

1. Starting at the downstream end of the structure, lay out the invert plates as shown on the assembly drawing. If the invert uses two plates across the width (or span), preassemble them leaving out the double bolts on each end of the seam. Insert the bolts from the bottom side so the nuts will be on the top side of the invert. Tighten these bolts.

Steps 2-3: Assemble invert starting at downstream end. Advance timber (which acts as bolt supports) as assembly progresses.

2. Lay the first invert section with the upstream edge sitting on a flat surface (a long, straight piece of lumber laid parallel to the corrugations works well). Place 1-1/4" bolts (with the threads up) into the leading edge bolt holes. Place the second invert section over the top of the first as shown in the detail on page 5. Finger tighten nuts onto the bolts.



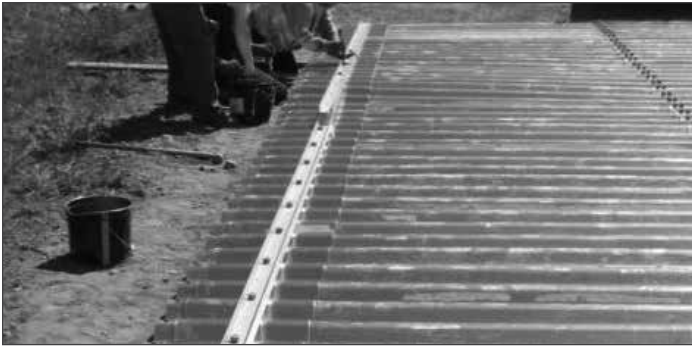
3. Repeat the above procedure until 5 sections (22.5') of the invert are loose bolted. Advance the piece of lumber in order to support each new row of bolts formed below the plate edge. Each completed section lays down onto the flat surface as assembly progresses.

Steps 4-5: Place supplemental plates (if required) and first set of receiving channels onto invert. Support invert edge (one side at a time) to allow access to bolt holes.

4. When supplemental plates are furnished, they should be placed onto the invert along its outside edges and aligned with the bolt holes in the invert plates. Reference the assembly drawing.
5. Place the first set of receiving channels onto both sides of the invert according to the assembly drawing. Use drift pins to help align the bolts holes. Bolts should be placed from the bottom to allow for torquing the nuts once all of the receiving channels are attached. The invert can be supported one side at a time to allow better access to the bolt holes. Care must be taken to maintain the 18" hole spacing by using drift pins to pull the invert holes in alignment with receiving channels holes. And, care must be taken to ensure that neither the left side nor the right side are running ahead of the other.



6. After the receiving channels are attached, tighten the invert with 90 to 115 ft.-lb. of torque and tighten the receiving channel to 115 to 135 ft.-lbs. of torque. Proceed in like manner until the entire invert is assembled.
7. There may be cut plates on one or both ends of the structure. There are numbers given to the cut plates for haunch, invert, supplemental plates or footing pads. The numbers for all cut plates are shown on the assembly drawing.



ALBC Shell

The invert end of the haunch plates have their corners painted red. Place the haunch plates outside of the receiving channel with the cut plates positioned as shown on the assembly drawing.

1. Starting at the upstream end, fasten the first ring of plates together while they lay on their sides. Only place and tighten those bolts that do not get a rib attached to it. Then tilt up this first ring and place it into the receiving channels.
2. Fasten both plates to the receiving channel or place in slotted footing on both sides of the first complete shell ring. Use drift pins to bring the holes into alignment (if required).
3. Place the next ring of shell plates and fasten those longitudinal seam bolts that do not get a rib attached to them.
4. Begin placement of ribs. See the assembly drawing for locations.



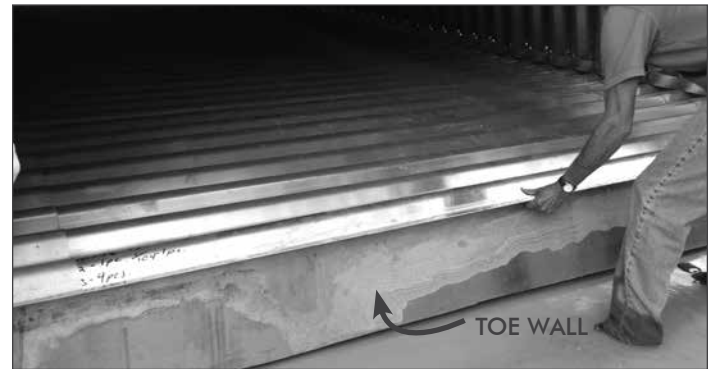
5. Attach the crown rib at the first complete circumferential seam. Insert and finger tighten the bolts. The nuts should be on the outside of the shell.
6. Attach both the haunch ribs at the same seam and finger tighten the bolts. Haunch ribs are best installed by bolting from the end nearest the crown rib. Tighten all nuts at this seam.
7. Place the next ring of shell plates that make up the third shell ring by setting them into the receiving channel (outside of the previous shell ring). Then, tilt them up into place. Fasten the longitudinal seam bolts except those that get a rib attached to them.
8. Repeat steps 2 through 7 until the entire shell is fastened with ribs at each circumferential seam.
9. Bolt remaining ribs onto shell in accordance with assembly drawing.
10. When all the ribs are attached, join all haunch and crown ribs that butt together with a rib splice.
11. Next, confirm that the whole shell has been tightened with 115 to 135 ft.-lbs. of torque. Torque the crown then the haunch ribs then the rib splices and finally any remaining plate seams. **DO NOT OVER TORQUE.** A good plate fit is far better than high torque.

Caution: In the event that the ribs do not fit perfectly onto the plates, it may be necessary to draw the ribs and the plates together using care not to pull the bolt heads through the plate. If the rib radius is larger than the plate radius, begin installing the rib bolts at the crown proceeding toward the haunches. If the rib radius is smaller than the plate radius, begin installing the bolts on both ends of the haunch ribs and proceed toward the middle of the haunch, one bolt at a time. When torquing these bolts, if the rib stands off of the plate significantly, it is best to work back and forth, partially tightening 2 to 4 adjacent bolts to achieve full torque.

If there is more than a 1/4" gap and the haunch plate is .150" or lighter, it may be necessary to use 2" galvanized washers under the bolt heads to prevent pull-through. Call the Winchester Plant Technical Services Team at 859-744-3339 if washers are needed.

Note: Many of these steps can occur concurrently based on crew size and experience provided each step is coordinated to allow adequate working space.

Caution: Do not attempt any loading of a box culvert structure (including lifting a pre-assembling structure into place) prior to attachment of stiffener ribs and the torquing of all nuts.

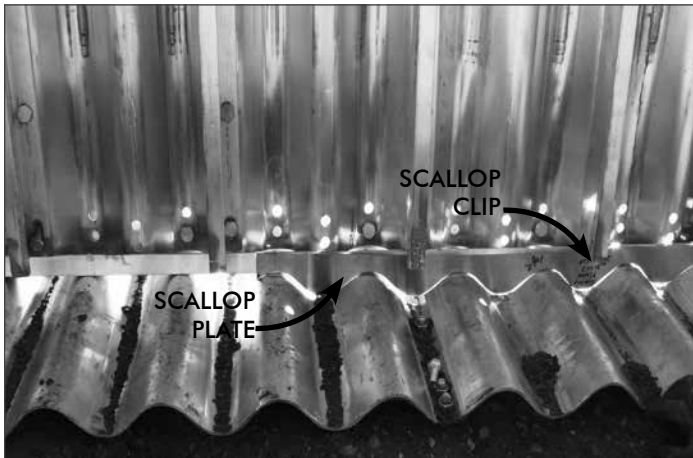


Toe Walls

Standard toe walls are 26" deep x 4" 'L' shaped un-corrugated plates that are pre-punched for attachment to the underside of invert. They are provided for both ends of all structures using a full invert to help prevent water from undermining the structure. The toe wall is bolted to the invert plates at the end row of bolt holes with the short horizontal leg pointing outward. To install toe walls, trench out an area on both ends of the structure to accommodate them. Trial fit the toe walls in the trench and determine if voids are present behind the toe wall. If so, lean the toe wall forward and hand place and tamp backfill material behind and in front of the toe wall while working them into final position from the bottom up. Place bolts from the bottom then attach nuts and tighten to 90 – 115 ft.-lbs of torque.

Toe walls can be pre-attached to the invert of a preassembled ALBC if the foundation material can be trenched accurately with no sloughing of material behind the toe walls. If sloughing of the foundation material occurs, detach the toe walls and follow the procedure in the previous paragraph.

Scallop Plates



Attach the scallop plates to the outside of the receiving channels using the scallop plate clips provided on 18" centers. It is not necessary to place a bolt in the threaded opening of the clip. The clips' spring action provides enough clamping force to hold the scallop plates in place. The scallop plates, along with the provided geotextile, help prevent migration of backfill material into the structure.

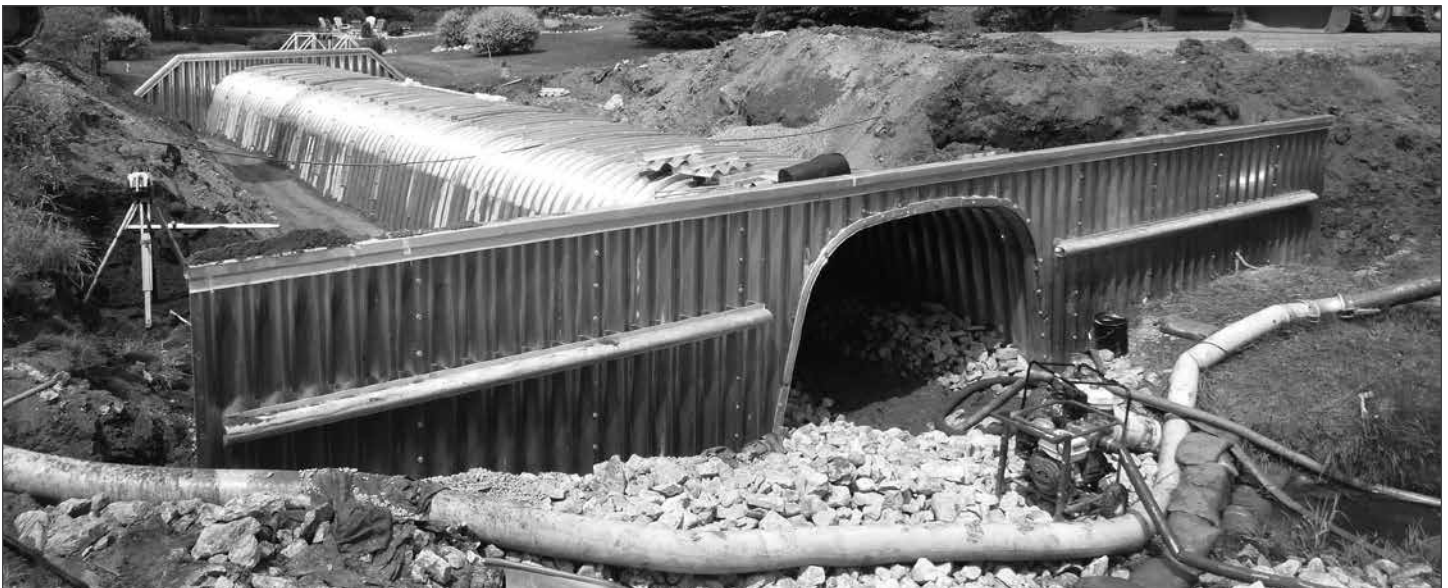
Next, lay out the geotextile on both sides of the structure. Fabric that is approximately 1.25 times the structure length is needed on each side. Place the geotextile loosely so that during backfill it will lay into the corrugations of the invert and the outside of the shell (see Appendix H).

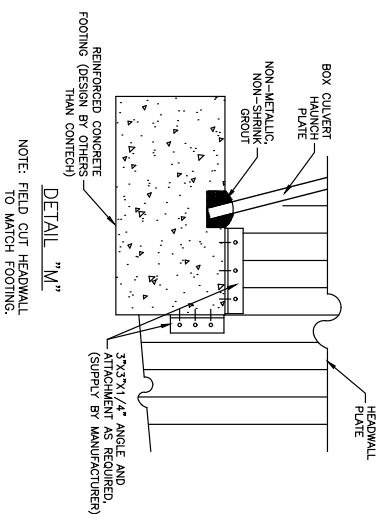
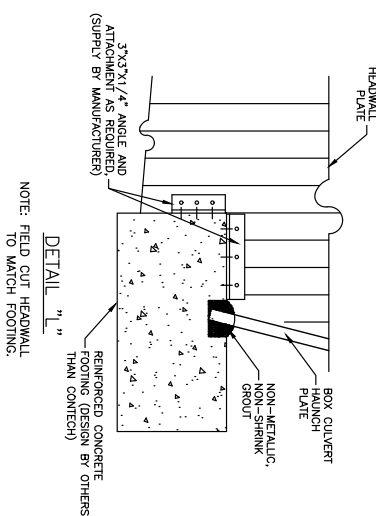


ALBC Headwalls / Wingwalls



1. Normally, beveled wingwall panels, headwall and wingwall caps, and elbow caps are trimmed at the plant to permit proper assembly. Field beveling of the panels can be done. However, appropriate modifications to the caps and elbows must be made. Caps and elbows must be cut, trimmed and rewelded such that they fit properly onto the panels.
2. Headwall and wingwall cap connection holes must be field drilled as shown on the Assembly Drawings.
3. All headwall and wingwall panels must be trenched approximately two feet into the existing ground or as directed by the project engineer/owner. If a stable rock foundation is encountered, these panels may be trimmed and placed into a concrete-grouted keyway in the bedrock.
4. The top of the headwall and wingwalls are at the same elevation unless otherwise shown on the drawings.
5. Corner wingwall panels are 4'-9" wide and include a vertical joint to permit wingwall rotations up to a maximum of 130°. Reference the Structural Plate Design Guide. Vertical joints are not included if wingwalls are in line with the headwall.





- NOTES:
1. ALL MARK IDENTIFICATIONS TO BE ON SOIL SIDE.
 2. BOLT BASEWALL TO REINFORCING RIB AT END OF STRUCTURE.
 3. SEE SHEET 3 OF 3 SHEETS FOR SECTIONS AND ASSEMBLY DETAILS.
 4. ALL 27" DIMENSIONS ARE RELATIVE TO SECTION B-B
 5. ALL 4'-1/2" DIMENSIONS ARE RELATIVE TO SECTION E-E

THE ASSEMBLY BOLTS AND NUTS ARE SPECIALLY DESIGNED WITH ROUNDED OR SPHERICAL THROATS PROVIDING MAXIMUM BEARING CONTACT AREA WITH THE PLATES WITHOUT THE USE OF WASHERS. NOTE THAT THE BOLTS AND NUTS SHOULD BE INSTALLED SUCH THAT THE ROUNDED PORTION IS IN CONTACT WITH THE PLATES.


SIZE 25'-2" x 6'-2" TYPE STRUCTURE BOX CULV. 8212		PLATE THICKNESS .250"(H) / .250"(C) REINFORCING AS SHOWN RIB SPACING AS SHOWN REINFORCING AS SHOWN NUMBER OF STRUCTURES 1	
CROWN LENGTH 6' 4.49'-9"			
<p> The undersigned hereby certifies that the above is a true and correct copy of the original drawing as submitted to the Department of Transportation, New York State Office of General Services, Division of Design, for review and approval. The undersigned further certifies that the above is a true and correct copy of the original drawing as submitted to the Department of Transportation, New York State Office of General Services, Division of Design, for review and approval. The undersigned further certifies that the above is a true and correct copy of the original drawing as submitted to the Department of Transportation, New York State Office of General Services, Division of Design, for review and approval. </p>			
<div style="display: flex; justify-content: space-between;"> <div>  <p> CINTECH ENGINEERED SOLUTIONS www.cintech.com 700 West Park, Westchester, NY 46391 855-744-3339 855-744-9665 FAX </p> </div> <div> <p> SAMPLE DRAWING </p> </div> </div>			
SAMPLE WINGWALL & HEADWALL DETAIL			
Drawing # 525456-010-AL-COIN-A		SALES ORDER NO.	
PROJECT NO. 525456	SHEET NO. 010	DATE 7/26/20	DRAWN: JSC
DESIGNED:	CHECKED:	APPROVED:	SHEET NO. 2 of 3

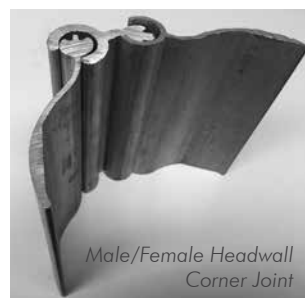
Figure 3. Sample Wingwall & Headwall Detail

Assembly Procedure

1. Start with a completely assembled and torqued box culvert shell. Recheck the span and rise dimensions when full inverts are not used. Make any corrections using come-alongs and/or struts.
2. Lay out the pre-cut headwall and wingwall panels, vertical joints, headwall caps and other miscellaneous parts as shown on the assembly drawing. Be sure all the parts are laid out as specified because some special cuts and/or panel lengths may be located in only one specific position. All headwall panels are marked on soil side. Be sure to orient the panels accordingly.
3. The headwall assembly is installed after the structure has been set into final position. The only preliminary steps that can be taken are:
 - Bolting ribs at each end of the structure to later receive field drilling for headwall attachment. Make certain that these ribs are installed with the "feet" pointing toward the ends of the structure. No splice ribs are used at the end rib locations.
 - Leveling, field drilling and attachment of the headwall center panels to the end ribs.
 - Bolting the female corner joint to the headwall end panel and bolting the male corner joint to the corner panel (if required).
4. Before any further assembly can be done, make sure the foundation has been trenched to receive the headwall and wingwall panels. Set the headwall into position.
5. Start at one end and attach both end panels of the headwall by field drilling through the panel and then through the end rib. Then bolt the two together. Bolt the end panels at every other corrugation starting at the top and working in both directions.
6. If the corner panel connection is straight, overlap and bolt the corner panels to the headwall end panels.
7. If the corner panel connection is not straight, join the corner panel and headwall by using the center corner joint with the pre-assembled male and female corner joints. Position the corner panel at the specified angle from the headwall. A small hole (1/4") may be field drilled through the corner joints and a bolt with a nut inserted to maintain the desired position. If wingwalls are in line with the headwall the 3-piece vertical joints are not needed or included.
8. Set the headwall cap in place. Then, set the elbow cap on top of the vertical joints (if required). One end of the elbow cap will slide inside the headwall cap.
9. Attach any additional wingwall panels to the corner panel as required.
10. Slide the wingwall caps into place over any elbow or joint caps. Connect the headwall and wingwall panel caps by field drilling at least three holes per panel and bolting them together. Make sure to leave the top center hole of each headwall panel for an anchor rod. Anchor rods go through the headwall cap on headwalls unless a wale beam is specified above the crown. See the assembly drawings.
11. On the headwall, locate the center of each panel and field drill through the cap holes and the panel. Take the 3/4" anchor rod and bolt one end through the cap with a bracing assembly and two 3/4" nuts (see assembly drawings). Lay the attached rod 90° to the headwall with the anchor rod attachment piece (ARAP) loosely bolted with two nuts to the other end of the rod. Then, determine which crown rib is closest to the end of the anchor rod. Field drill a hole in the rib at this location and attach the ARAP to the rib with a bolt and nut. Repeat for all remaining rods. Be sure that the headwall is kept plumb and perpendicular to the box culvert shell and that the anchor rod is straight and taut.

Caution: For Type IV ribs, the reinforcing rib must be positioned (oriented) such that the toe is pointing toward the headwall and the ARAP is on the flat side away from the headwall.

12. On each wingwall panel, field drill holes on 27" center of center as shown on the assembly drawings. Then attach the wale beam on the outside of the wingwall panels with a wale nut, 3/4" bolts and an anchor rod. At the other end of the anchor rod, attach the dead man anchor. Position the dead man anchor as shown on the assembly drawings. It is important that all dead man anchors are oriented correctly so that the proper support is afforded to the corner and wingwall panel sections. The corrugated deadman panel goes toward the wall and the structural hardware goes behind the deadman panel. For some installations, where the fill slope is nearly level, a dual deadman assembly may be used. See the Structural Plate Design Guide and the assembly drawings.
13. Torque all bolts and rods to 115 to 135 ft.-lbs. cut off any excess anchor rod that protrudes from the headwall. Do not over torque.
14. Finally, place the geotextile provided along the headwall/structure seams as shown in the assembly drawings (see Appendix H).



Out of Trench Assembly

Because aluminum is lightweight, the assembled structure can often be lifted with light duty equipment (see Appendix C for more detail). See the structural plate load slip, the Contech product catalog or contact a Contech representative for the handling weight of the structure. It may be advantageous to preassemble the structure. For example, removing the existing bridge and preparing the footing while the structure is being assembled may be the most effective approach to the project. Setting the structure into place all at once minimizes the risk of damage that can occur due to sudden exposure to hydraulic forces. Review the "Precautions" section of the Structural Plate Design Guide. Review the "Special Assembly Considerations" and "Lifting" sections of these instructions.

Where full inverts are not used, spreaders or ties may be required across the bottom of the structure. These help maintain the proper shape and dimensions of the structure during handling and lifting. They must be removed after the installation is complete.

Check to make sure that no unused bolt holes remain in the structure except along the bottom edge. These are covered by the geotextile provided.

Area Needed

The assembly area must be fairly flat and free of large brush, stumps, or tress. Out of trench assembly should be as close to the installation site as possible. Utilize the roadway for an assembly area when practical. In those cases where there are no level places to assemble the structure, make arrangements to level an area for assembly. The assembly area required is the width of the structure (span) + 15' by the length of the structure. The additional 15' may be needed to layout plates and to provide the necessary working area.

Lifting

Lifting preassembled sections of structures or entire structures is a proven and fairly common method of installation. However, attention must be given to proper techniques and safety measures. Structure must be lifted carefully in a controlled and balanced fashion. Many structures have been lifted into place using lifting shackles. The capacity of lifting shackles will depend upon the size, length and weight of the structure.

The use of a spreader bar with multiple lifting points is desirable since this serves to control distortions and better distribute lifting loads. Additionally, these loads are transmitted vertically to the structure, minimizing eccentric forces on lift assemblies and excessive bending.

The contractor must review any lifting procedure to ensure that an adequate safety factor has been provided. The contractor must lift the structure into place in such a manner as to not damage the structure (see Appendix C for additional details). Review all applicable safety guidelines.

Caution: Do not attempt any loading of a structure (including lifting of pre-assembled structure into place) prior to the attachment of reinforcing ribs and the torquing of all nuts. For structures without full inverts, come-alongs, ties and/or struts will be required to maintain span dimensions.



Heavy Construction Load Considerations

Heavy construction loads that exceed that of the particular highway live load design limits are not allowed on an ALBC without approval from the project engineer.

The addition of temporary soil cover for heavy construction loads is not feasible or permissible for ALBC structures. By design, these structures are limited in the range of permissible fill heights and live loads. If pavement is not in place prior to live load, see Appendix B for more information. For additional questions, contact your local Contech representative about permissible live loads and allowable soil cover heights (minimum and maximum) for ALBC.

Standard highway loads that meet the permissible design load limits for an aluminum box culvert (ALBC) are not allowed on the ALBC until it is backfilled completely and the pavement is in place. See the design information specific to the project for the allowable live load and the permissible range of cover.

Backfill

Satisfactory backfill material, proper placement and compaction are key factors in obtaining maximum strength and stability. Compaction needs to be achieved under the haunches by carefully tamping a granular or select material.

The backfill material should be free of rocks, frozen lumps and foreign material that could cause hard spots or decompose to create voids. Backfill material should be well graded granular material that meets the requirements of AASHTO M 145 for soil classifications A-1, A-2, or A-3* (see Table 2). Backfill must be placed symmetrically on each side of the structure in 8-inch uncompacted lifts. Each lift is to be compacted to a minimum of 90 percent density per AASHTO T 180.

A high percentage of silt or fine sand in the native soils suggests the need for a well graded granular backfill material to prevent soil migration.

During backfill, only small tracked vehicles (D4 or smaller) should be near the structure as fill progresses above the crown and to the finished grade. The engineer and contractor are cautioned that the minimum cover may need to be increased to handle temporary construction vehicle loads (larger than D4).

Salt Water Installation

In salt water installations, the bedding and backfill around the structure must be clean granular material. If the backfill is subject to possible infiltration by the adjacent native soil, the clean granular backfill should be wrapped in a geotextile. Aluminum fasteners are available for salt water applications if specified.

Precautions

During installation and prior to the construction of permanent erosion control and end treatment protection, special precautions may be necessary.

The structure must be protected from unbalanced loads from any structural loads or hydraulic forces that might bend or distort the unsupported ends of the structure.

Erosion or washout of previously placed soil support must be prevented to ensure that the structure maintains its load capacity.

TABLE 2 - BACKFILL SOIL CLASSIFICATIONS

GROUP CLASSIFICATION	A-1-a	A-1-b	A-2-4	A-2-5	A-3*
Sieve Analysis Percent Passing					
No. 10 (2.000 mm)	50 max.	----	----	----	----
No. 40 (0.425 mm)	30 max.	50 max.	----	----	51 max.
No. 100 (0.150 mm)	----	----	50 max.	50 max.	----
No. 200 (0.075 mm)	15 max.	25 max.	20 max.	20 max.	10 max.
Atterberg Limits for Fraction Passing No., 40 (0.425 mm)					
Liquid Limits	----	----	40 max.	41 max.	----
Plasticity Index	6 max.	6 max.	10 max.	10 max.	Non Plastic
Usual Materials	Stone Fragment, Gravel and Sand		Silty or Clayey Gravel and Sand		Sand

NOTE: Atterberg Limits are modified to provide materials that are primarily granular

* A-3 material may be utilized only with structure numbers 1 through 87, and may not contain fine beach sands, windblown sands, stream deposited sand, etc. exhibiting fine, rounded particles.

Backfill Sequence

Foundation must provide 4,000 lbs per square foot allowable bearing capacity, or as designed by project engineer. See Appendix A for additional detail.



Granular material placed in balanced manner.



Small tracked vehicles are okay once sufficient cover is placed and compacted.



Loosely placed geotextile over scallop plate and exterior of invert plate.



Backfill material is placed carefully before 8" lifts are spread evenly and compacted.

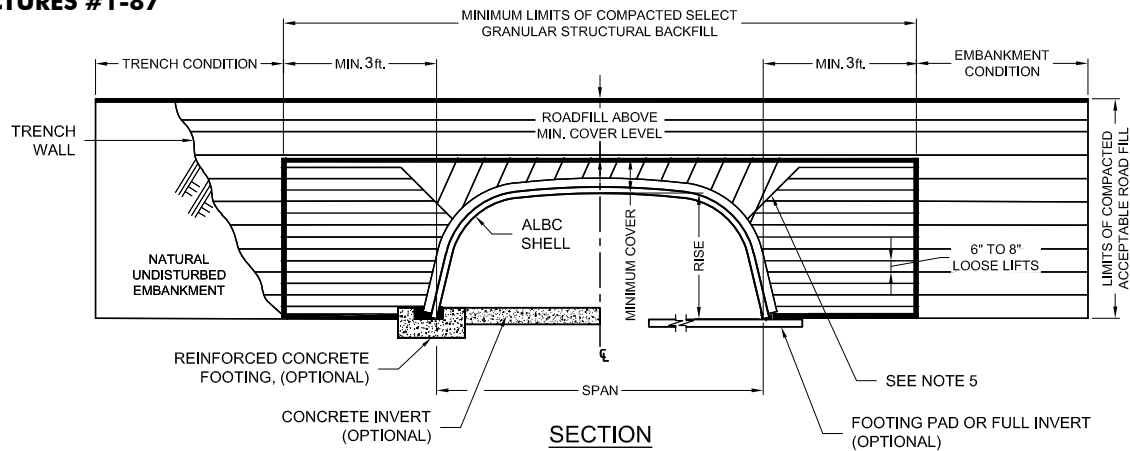


Backfill material is placed and spread from a distance with an excavator, then compacted with a vibratory plate compactor.

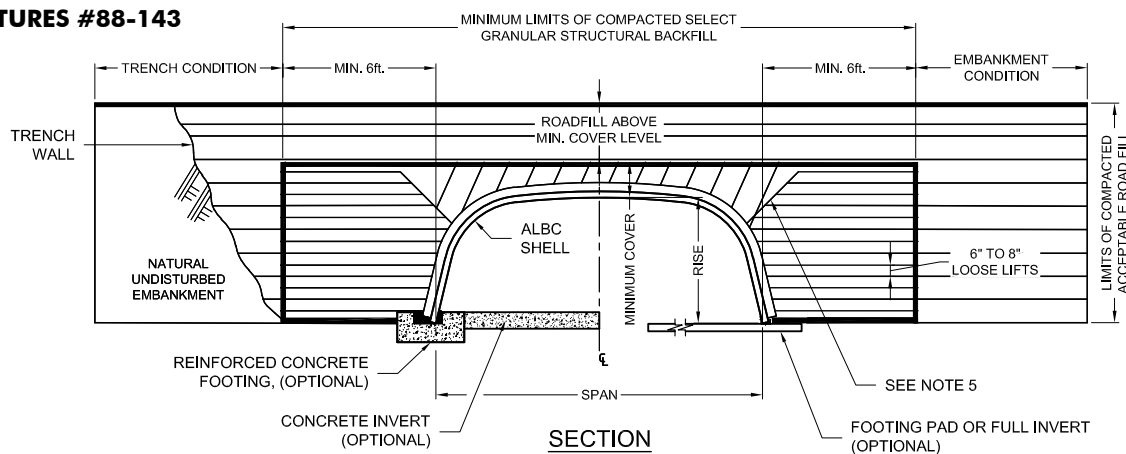


Appendix A - Typical Backfill Cross Section

STRUCTURES #1-87



STRUCTURES #88-143



SELECT GRANULAR STRUCTURAL BACKFILL LIMITS.



INITIAL LIFTS OVER CROWN OF STRUCTURE AS INDICATED BY SHADED AREA TO BE COMPACTED TO REQUIRED DENSITY WITH HAND OPERATED EQUIPMENT OR WITH SMALL TRACTOR (D-4 OR SMALLER) DRAWN EQUIPMENT.

NOTES:

- ALL SELECT GRANULAR BACKFILL TO BE PLACED IN A BALANCED FASHION IN THIN LIFTS (6"-8" LOOSE TYPICALLY) AND COMPACTED TO 90 PERCENT DENSITY PER AASHTO T-180.
- COMPLETE AND REGULAR MONITORING OF THE ALUMINUM BOX CULVERT SHAPE IS NECESSARY DURING ALL BACKFILLING OF THE STRUCTURE.
- PREVENT DISTORTION OF SHAPE AS NECESSARY BY VARYING COMPACTION METHODS AND EQUIPMENT.
- TRENCH WIDTH OTHER THAN 3ft. SHALL BE BY DIRECTION OF THE ENGINEER OF RECORD.
- SWITCH TO PLACING SELECT GRANULAR BACKFILL IN RADIAL LIFTS AT APPROXIMATELY 75% OF THE RISE OF THE STRUCTURE.

ADDITIONAL SELECT GRANULAR STRUCTURAL BACKFILL NOTES:

SATISFACTORY BACKFILL MATERIAL, PROPER PLACEMENT, AND COMPACTION ARE KEY FACTORS IN OBTAINING MAXIMUM STRENGTH AND STABILITY.

THE BACKFILL MATERIAL SHOULD BE FREE OF ROCKS, FROZEN LUMPS, AND FOREIGN MATERIAL THAT COULD CAUSE HARD SPOTS OR DECOMPOSE TO CREATE VOIDS. BACKFILL MATERIAL SHOULD BE WELL GRADED GRANULAR MATERIAL THAT MEETS THE REQUIREMENTS OF AASHTO M-145 FOR SOIL CLASSIFICATIONS A-1, A-2, A-3. * SEE THE SOIL GROUP CLASSIFICATION TABLE ON THIS SHEET. BACKFILL MUST BE PLACED SYMMETRICALLY ON EACH SIDE OF THE STRUCTURE IN 6" TO 8" LOOSE LIFTS. EACH LIFT IS TO BE COMPACTED TO A MINIMUM OF 90% DENSITY PER AASHTO T-180.

A HIGH PERCENTAGE OF SILT OR FINE SAND IN THE NATIVE SOILS SUGGESTS THE NEED FOR A WELL GRADED GRANULAR BACKFILL MATERIAL TO PREVENT SOIL MIGRATION.

DURING BACKFILL, ONLY LIGHTWEIGHT TRACKED VEHICLES (D-4 OR LIGHTER) SHOULD BE NEAR THE STRUCTURE AS FILL PROGRESSES ABOVE THE CROWN AND TO THE FINISHED GRADE.

GROUP CLASSIFICATION	A-1-a	A-1-b	A-2-4	A-2-5	A-3*
Sieve Analysis Percent Passing					
No. 10 (2.000 mm)	50 max.	---	---	---	---
No. 40 (0.425 mm)	30 max.	50 max.	---	---	51 max.
No. 100 (0.150 mm)	---	---	50 max.	50 max.	---
No. 200 (0.075 mm)	15 max.	25 max.	20 max.	20 max.	10 max.
Atterberg Limits for Fraction Passing No., 40 (0.425 mm)					
Liquid Limits	---	---	40 max.	41 max.	---
Plasticity Index	6 max.	6 max.	10 max.	10 max.	Non Plastic
Usual Materials	Stone Fragment, Gravel and Sand		Silty or Clayey Gravel and Sand		Sand

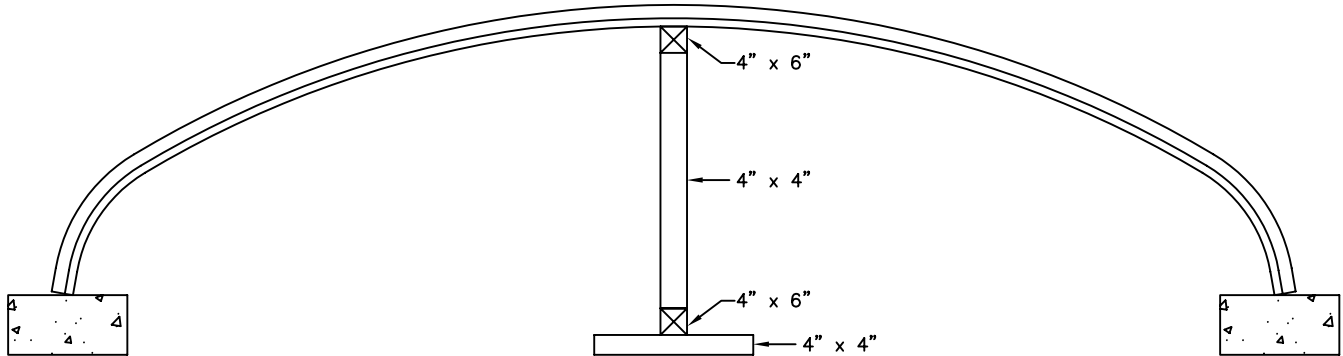
NOTE: Atterberg Limits are modified to provide materials that are primarily granular

* A-3 material may be utilized only with structure numbers 1 through 87, and may not contain fine beach sands, windblown sands, stream deposited sand, etc. exhibiting fine, rounded particles.

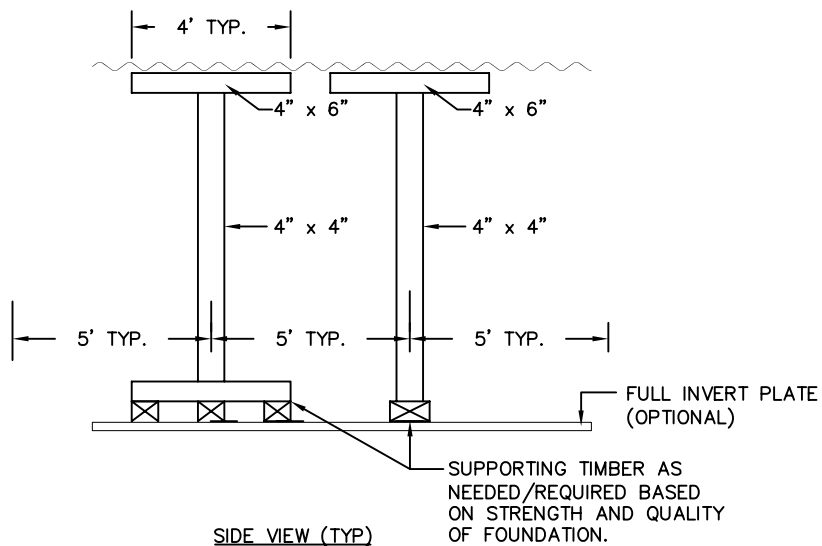
Appendix B - Vehicular Loads and Bracing Concepts

Paving Schedule Issues/Timing – In the event the pavement cannot be placed before an ALBC needs to carry standard vehicular traffic, it may be possible to use center struts or bracing frames to temporarily provide additional structural support to the ALBC.

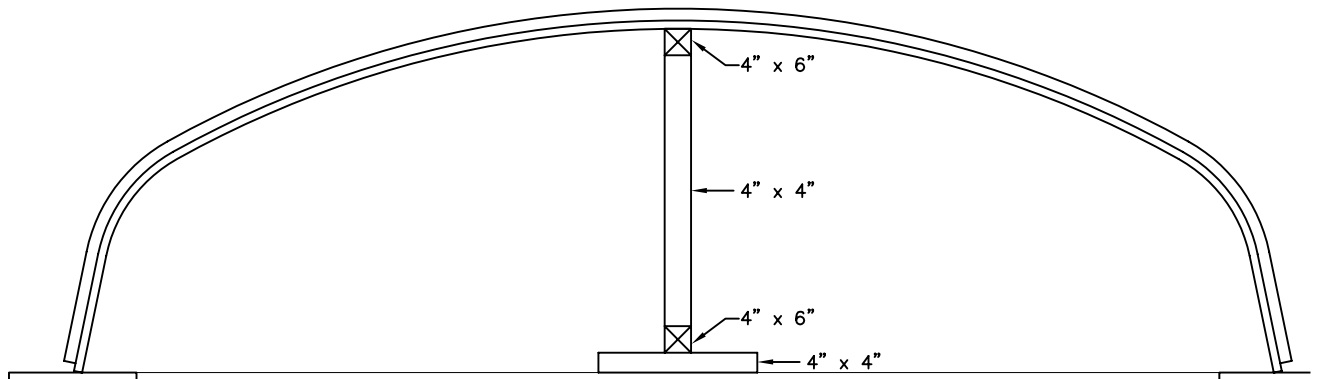
A bracing system should be designed by a qualified engineer. Below are conceptual details of a bracing system. Note that the bracing may contain significant compressive stresses and safe practices must be used when removing the braces after the paving operations are completed.



BRACING ALBC ON R/C FOOTINGS (TYP)



SIDE VIEW (TYP)



BRACING ALBC ON FULL INVERT (TYP)

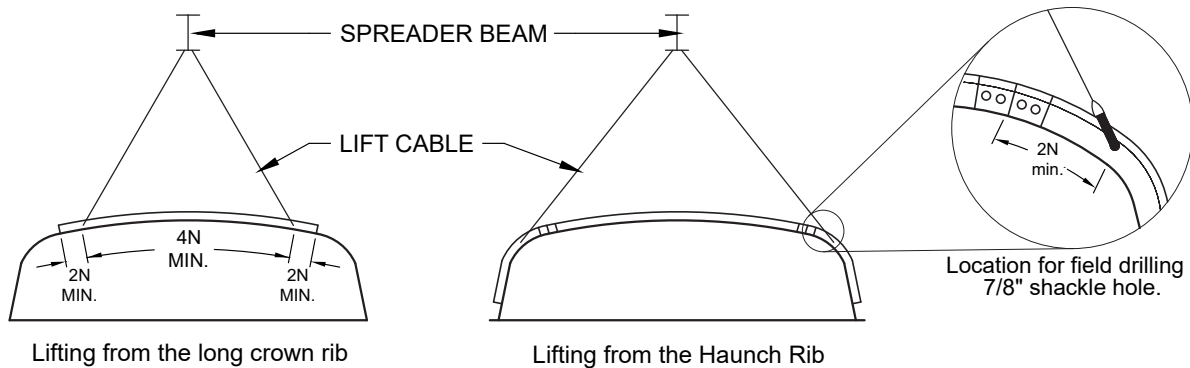
Note: A bracing plan should be project specific and be reviewed by a qualified engineer.

Appendix C - Lifting Detail

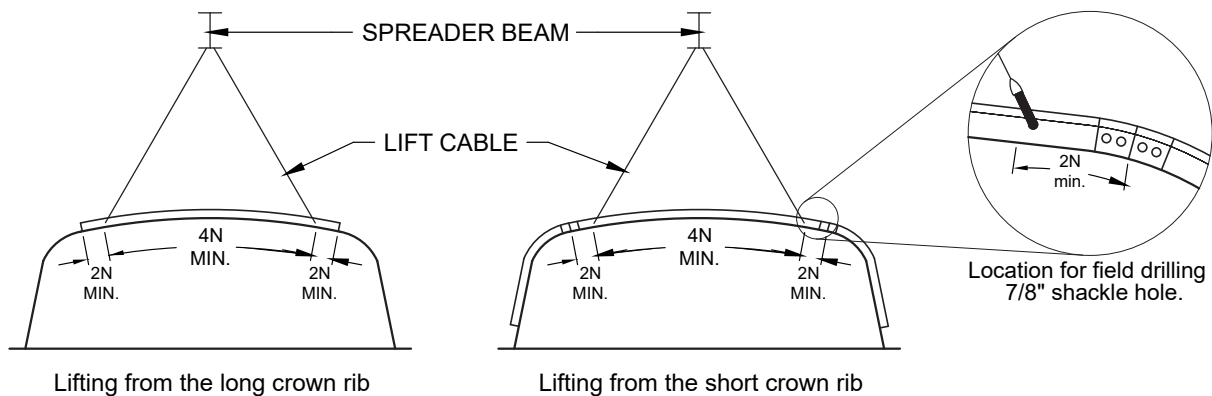
THESE ARE SUGGESTED GUIDELINES ONLY. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE LIFTING PROCEDURE. IT IS RECOMMENDED THAT A QUALIFIED ENGINEER BE ENGAGED TO DETAIL THE PROCEDURE.

- Determine the number of lifting points (n) and the appropriate spacing (D) based on the shackle capacities and the method. **See Note 1.**
- Boxes 1-25 should be lifted from the LONG Crown Ribs (Crown Ribs that are not spliced to Haunch Ribs) or from the Haunch Ribs. See diagrams below.
- Boxes 26-87 must always be lifted from the Crown Ribs (preferably ones spliced to Haunch Ribs.) See diagrams below.
- Lift Shackles need to be at least 2N from a Rib Splice, at least 4N from each other, and at least 2N from the end of a rib.
- Lift Shackles should be $\leq D/2$ from the end of the structure but no greater than 8'.
- For Structures 88 and greater, please contact your local Contech representative.

Lifting Structures 1-25



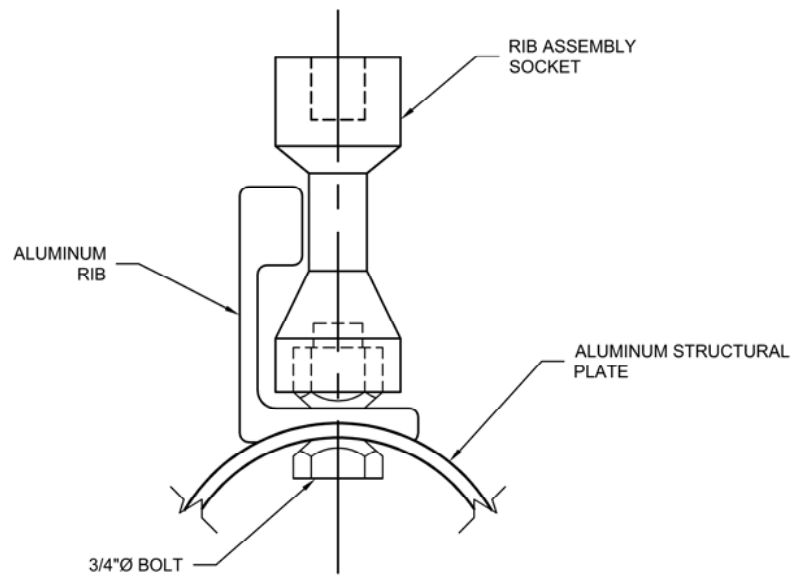
Lifting Structures 26-87



NOTES

1. Prior to lifting, be sure the box is free of dirt, mud, or other foreign matter that may increase the weight of the structure.
2. Do not jerk the box when lifting.
3. Do not allow lifted box to hit other material or be abused in any manner.
4. No person should be beneath or near a lifted box.

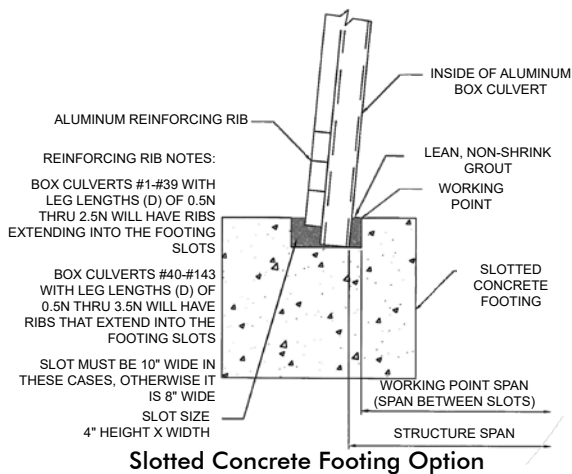
Appendix D - Rib Assembly Socket



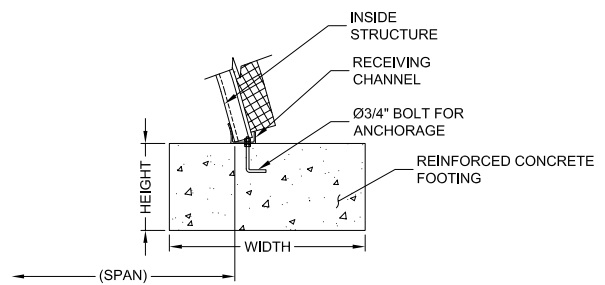
RIB ASSEMBLY SOCKET

NOTE:
THE RIB ASSEMBLY SOCKET IS USED FOR THE INSTALLATION OF
REINFORCING RIBS ON ALUMINUM STRUCTURAL PLATE PRODUCTS.
THIS IS A 6 POINT SOCKET FOR 1-1/4" NUTS AND HAS 3/4" DRIVE.

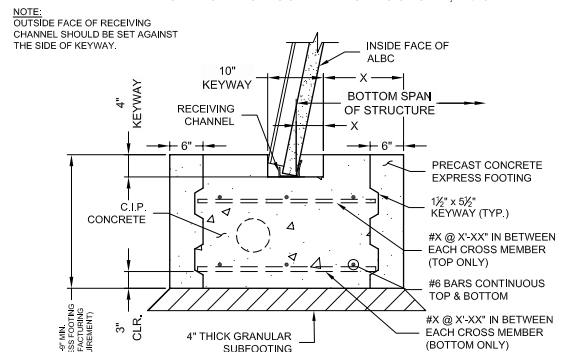
Appendix E - Footing Options



Slotted Concrete Footing Option



Receiving Channel Footing Option



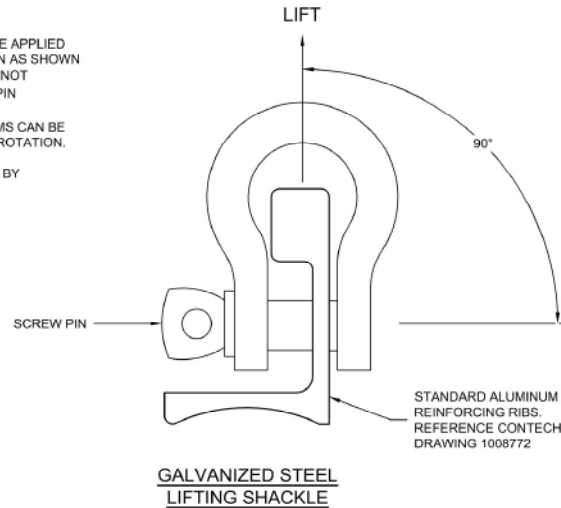
EXPRESS® Foundations Footing Option

Appendix F - Lifting Shackle Detail

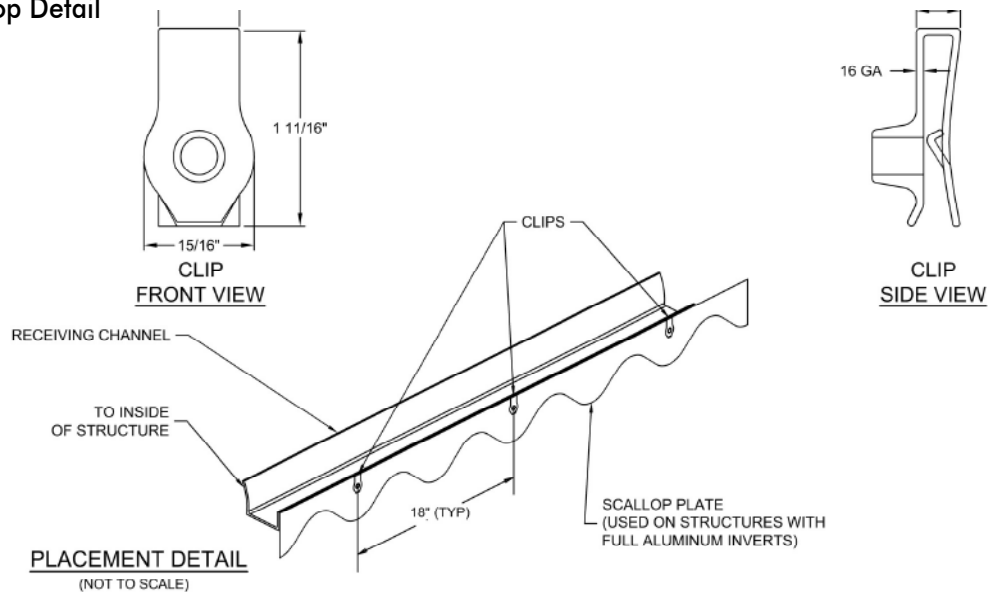
NOTES:

1. THE LIFTING FORCE MUST BE APPLIED PERPENDICULAR TO THE PIN AS SHOWN. ACTUAL LIFTING LOADS CANNOT EXCEED 6500 LBS. FOR A $\frac{3}{8}$ " PIN AND 9500 LBS. FOR A $\frac{1}{2}$ " PIN. A SPREADER BEAM OR BEAMS CAN BE USED TO ACHIEVE THIS 90° ROTATION.

2. LIFTING SHACKLE SUPPLIED BY OTHERS THAN CONTECH.



Appendix G - Scallop Detail



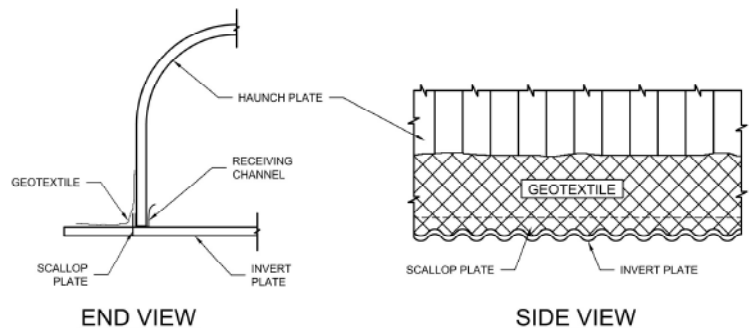
NOTE: THIS CLIP HAS MANY DIFFERENT USES. WHEN USED AS A "PUSH-ON" RETAINER FOR THE SCALLOP PLATE, THE THREADED PORTION IS NOT UTILIZED. BOLTS ARE NOT SUPPLIED AND ARE NOT NECESSARY.

Appendix H - Geotextile with Scallop Detail

ALUMINUM BOX CULVERTS WITH FULL INVERTS REQUIRE THE PLACEMENT OF A GEOTEXTILE ALONG THE SCALLOP PLATE. THE USE OF THE GEOTEXTILE PREVENTS THE INFILTRATION OF THE BACKFILL THROUGH THE UNFILLED BOLT HOLES AND THE SPACE BETWEEN THE INVERT PLATE AND THE SCALLOP PLATE. A ROLL OF GEOTEXTILE IS PROVIDED FOR THIS PURPOSE.

THE GEOTEXTILE SHOULD BE PLACED ALONG THE OUTSIDE OF THE HAUNCH PLATE AND HELD IN PLACE WHILE THE FIRST LIFT OF BACKFILL MATERIAL IS PLACED BY HAND. CARE SHOULD BE TAKEN TO ENSURE THAT THE GEOTEXTILE REMAINS IN CONTACT WITH THE HAUNCH, SCALLOP AND INVERT PLATE, AS SHOWN BELOW, DURING BACKFILL. THE LENGTH OF GEOTEXTILE REQUIRED ON EACH SIDE OF THE STRUCTURE IS EQUAL TO 1.25 TIMES THE STRUCTURE LENGTH. THIS ALLOWS THE GEOTEXTILE TO BE SEATED INTO THE CORRUGATIONS OF THE INVERT AND HAUNCH PLATES.

OTHER METHODS OF PLACEMENT ARE ACCEPTABLE PROVIDED THAT SUFFICIENT COVERAGE OF THE UNFILLED BOLT HOLES AND THE SPACE BETWEEN THE SCALLOP PLATE AND THE INVERT PLATE IS ACCOMPLISHED.





CONTECH
ENGINEERED SOLUTIONS
800-338-1122
www.ContechES.com

SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

Contech Engineered Solutions provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater and earth stabilization products. For information on other Contech division offerings, visit www.ContechES.com or call 800.338.1122

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS AN EXPRESSED WARRANTY OR AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. SEE THE CONTECH STANDARD CONDITIONS OF SALE (VIEWABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

I:\AD\CONTECH-CPL\COM\ROOT\MERLIN\PROJECT\ACTIVE\586272\586272-10-ALUMINUM BOX CULVERT\DRAWING\CONTRACT\586272-010-AL-CON-A.DWG 3/27/2018 9:48 AM

IMPORTANT:
ASSEMBLY INSTRUCTIONS WILL BE SHIPPED WITH THE STRUCTURE. THEY ARE LOCATED IN THE BRIGHTLY COLORED BOLT KEG.

NOTES:

- INVERT END OF HAUNCH RIBS PAINTED RED.
- WHEN A FULL CORRUGATED INVERT IS USED, IT IS ANTICIPATED THAT NO BACKFILL MATERIAL WILL BE PLACED INSIDE THE STRUCTURE AND ON TOP OF THE INVERT PLATES. THEREFORE, SCALLOPED CLOSURE PLATES ARE TO BE CLIPPED TO THE OUTSIDE OF THE RECEIVING CHANNEL TO MINIMIZE BACKFILL INFILTRATION IN THE VALLEYS OF THE CORRUGATED INVERT PLATE BELOW THE RECEIVING CHANNEL.
NOTE: THIS DOES NOT MAKE A JOINT TIGHT ENOUGH TO PREVENT INFILTRATION OF FINE SILTS OR SANDS. THE USE OF A GEOTEXTILE PREVENTS THE INFILTRATION OF THE BACKFILL THROUGH THE UNFILLED BOLT HOLES AND THE SPACE BETWEEN THE INVERT PLATE AND THE SCALLOP PLATE. A ROLL OF GEOTEXTILE IS PROVIDED FOR THIS PURPOSE. WHEN SHORT FOOTING PADS ARE USED, THE SCALLOPED CLOSURE PLATES ARE NOT PROVIDED UNLESS ORDERED AS AN EXTRA, SINCE IT IS ANTICIPATED THESE FOOTING PLATES WILL BE BURIED.
- INVERT END OF RIBS PAINTED RED.

GENERAL NOTES:

- CONFIRMATION OF COVER - THIS STRUCTURE IS WITHIN THE MINIMUM AND MAXIMUM ALLOWABLE HEIGHT OF COVER, FOR THE DESIGNATED LOADING, AS FOLLOWS:

LOADING: **HS-20**

MINIMUM COVER (FT): **1.8'**

MAXIMUM COVER (FT): **4**

- FOR PROPER BOLT SIZE USAGE, REFER TO THE FOLLOWING:

PLATE ONLY

	1 PLATE	2 PLATE	3 PLATE	4 PLATE
0.100" - 0.125" THK. PLATE		1 1/4"	1 1/4"	1 1/2"
0.150" - 0.200" THK PLATE		1 1/4"	1 1/2"	2"
0.225" - 0.250" THK. PLATE		1 1/2"	2"	2"

PLATE W/ T2 OR T4 REINFORCING RIB OR RECEIVING CHANNEL

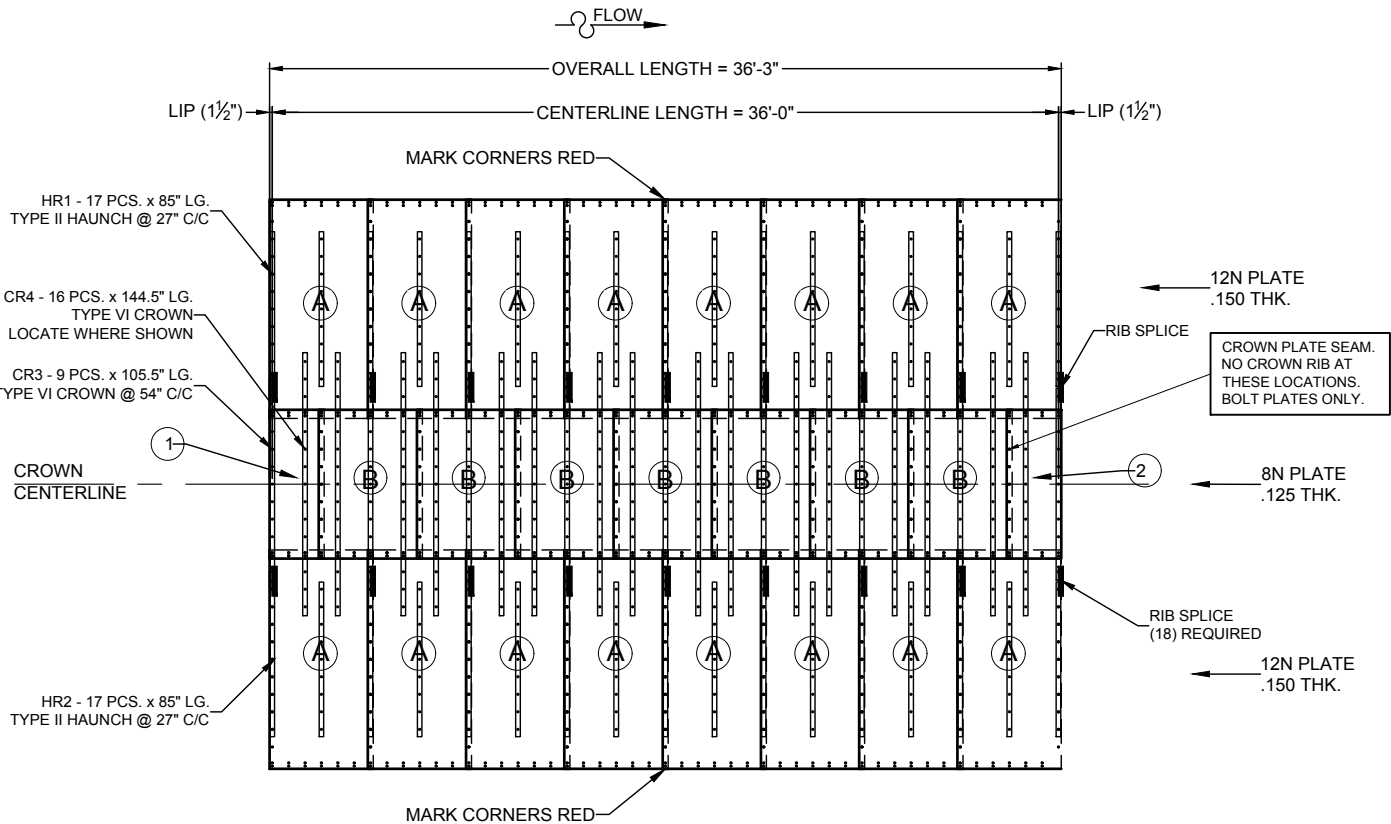
	1 PLATE	2 PLATE	3 PLATE	4 PLATE
0.100" - 0.125" THK. PLATE	1 1/4"	1 1/2"	1 1/2"	2"
0.150" - 0.200" THK PLATE	1 1/4"	2"	2"	2"
0.225" - 0.250" THK. PLATE	1 1/2"	2"	2"	2"
0.250" THK. PLATE	1 1/2"	2"	2"	2 1/2"

PLATE W/ T6 REINFORCING RIB

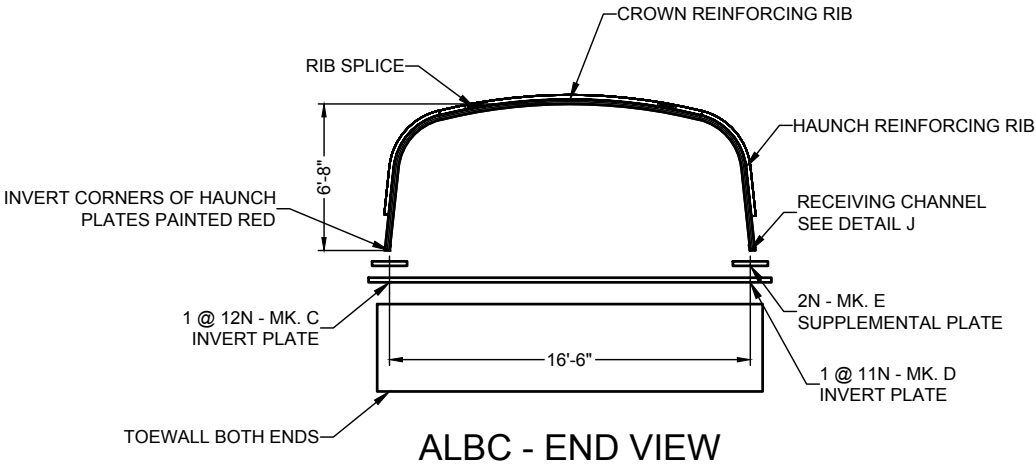
	1 PLATE	2 PLATE	3 PLATE	4 PLATE
0.100" - 0.125" THK. PLATE	1 1/2"	2"	2"	2"
0.150" - 0.200" THK PLATE	2"	2"	2"	2 1/2"
0.225" - 0.250" THK. PLATE	2"	2"	2 1/2"	2 1/2"
0.250" THK. PLATE	2"	2"	2 1/2"	2 1/2"

- NUTS MAY BE LOCATED ON STRUCTURE'S INTERIOR OR EXTERIOR TO ALLOW CONVENTIONAL ACCESS DURING ASSEMBLY AND TORQUING. ONLY ONE SIDE OF NUT HAS A CURVED SURFACE AND IT SHOULD BE IN DIRECT CONTACT WITH PLATE VALLEY.
- ALL PLATE LAPS AND REINFORCING RIBS MUST BE PROPERLY MATED IN A TANGENT FASHION USING PROPER ALIGNMENT TECHNIQUES AND HELD IN ALIGNMENT BY FASTENERS (FINGER TIGHTENED ONLY). BEFORE BACKFILLING COMMENCES, ALL FASTENERS MUST BE TORQUED FOR ADEQUATE COMPONENT CONTACT. GOOD COMPONENT FIT IS BETTER THEN HIGH TORQUE.
- FASTENER TORQUE REQUIREMENTS: 0.100" THICK PLATE AT 90-155 FOOT-POUNDS. FOR ALL THICKER PLATES AND REINFORCING RIBS, TORQUE AT 115-135 FOOT-POUNDS. TORQUE LEVELS ARE FOR INSTALLATION, NOT RESIDUAL, IN-SERVICE REQUIREMENTS. SINCE TORQUING MAY LOOSEN PREVIOUSLY TIGHTENED FASTENERS, MULTIPLE PASSES MAY BE NECESSARY. WHEN SEAM SEALANT TAPE IS USED, FASTENERS SHOULD BE TORQUED AGAIN AFTER 24 HOURS.
- ALL ALUMINUM STRUCTURAL PLATE MATERIAL IS MANUFACTURED IN ACCORDANCE WITH AASHTO M219, ASTM B746 AND ASTM B864 SPECIFICATIONS. SEE ASSEMBLY INSTRUCTIONS SHIPPED WITH MATERIAL IN FASTENER CONTAINER. ALSO REFER TO SPECIFIC PRODUCT CATALOG FOR ADDITIONAL PRODUCT INFORMATION.

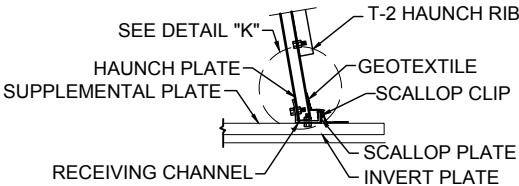
THE ASSEMBLY BOLTS AND NUTS ARE SPECIALLY DESIGNED WITH ROUNDED OR SPHERICAL THROATS FOR FITTING EITHER THE CREST OR VALLEY OF THE CORRUGATIONS, PROVIDING MAXIMUM BEARING CONTACT AREA WITH THE PLATES WITHOUT THE USE OF WASHERS. NOTE THAT THE BOLTS AND NUTS SHOULD BE INSTALLED SUCH THAT THE ROUNDED PORTION IS IN CONTACT WITH THE PLATES.



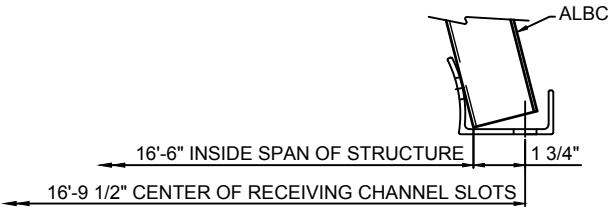
ALBC - DEVELOPED PLAN (OUTSIDE VIEW)
16'-6" SPAN x 6'-8" RISE



ALBC - END VIEW



DETAIL "J"



DETAIL "K"

FOR APPROVAL

TYPE: BOX SIZE: 37A6 SPAN: 16'-6" RISE: 6'-8" LENGTH @ 1: 36'-0"		INLET	OUTLET	PLATE THICKNESS: .150 (H).125(C) REINFORCING RIB SPACING: AS SHOWN REINFORCING RIB TYPE: AS SHOWN NUMBER OF STRUCTURES: 1
	SKEW	0	0	
	BEVEL	0	0	

BOY SCOUT LAKE BOX CULVERT

KODIAK, AK

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
700 Tech Drive, Winchester, KY 40391
859-744-3339 859-744-9665 FAX

CONTECH
STRUCTURAL PLATE

CONTECH
CONTRACT
DRAWING

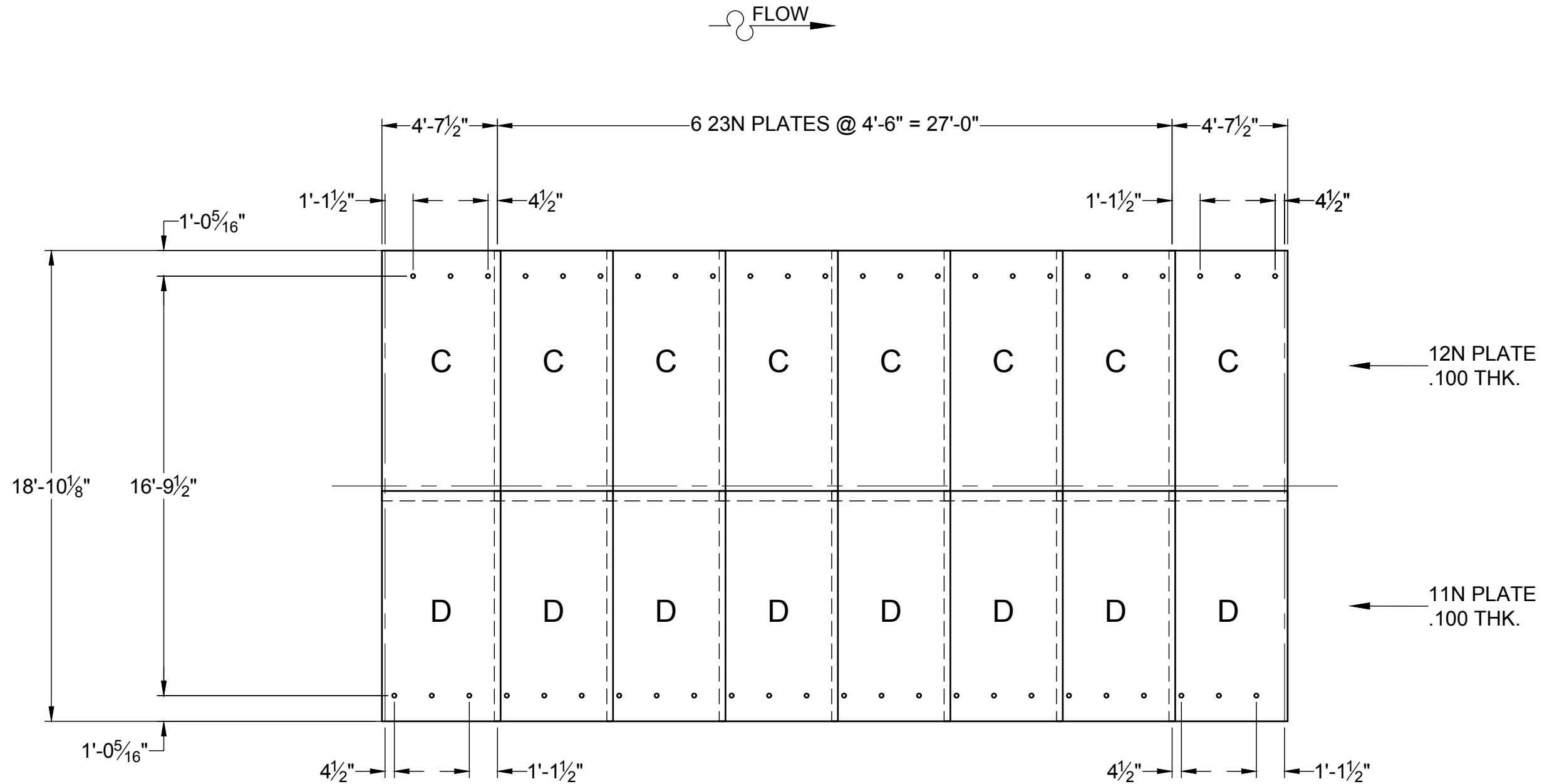
The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY

PROJECT No.: 586272	SEQ. No.: 010	DATE: 3/27/2018
DESIGNED:	DRAWN: JSC	
CHECKED:	APPROVED:	
SHEET NO.: 1 OF 5		

I:\AD\CONTECH-CPL\COM\ROOT\MERLIN\PROJECT\ACTIVE\586272\586272-10-ALUMINUM BOX CULVERT\DRAWINGS\CONTRACT\586272-010-AL-CON-A.DWG 3/27/2018 9:48 AM



ALBC - INVERT PLATES PLAN VIEW

NOTE: USE 1-1/4" LG. BOLTS ON OVERLAPPING SEAM

TYPE: BOX SIZE: 37A6 SPAN: 16'-6" RISE: 6'-8" LENGTH @ 1: 36'-0"		INLET	OUTLET	PLATE THICKNESS: .150 (H) .125 (C) REINFORCING RIB SPACING: AS SHOWN REINFORCING RIB TYPE: AS SHOWN NUMBER OF STRUCTURES: 1
	SKEW	0	0	
	BEVEL	0	0	

FOR APPROVAL

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.			
If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.			
MARK	DATE	REVISION DESCRIPTION	BY

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
700 Tech Drive, Winchester, KY 40391
859-744-3339 859-744-9665 FAX

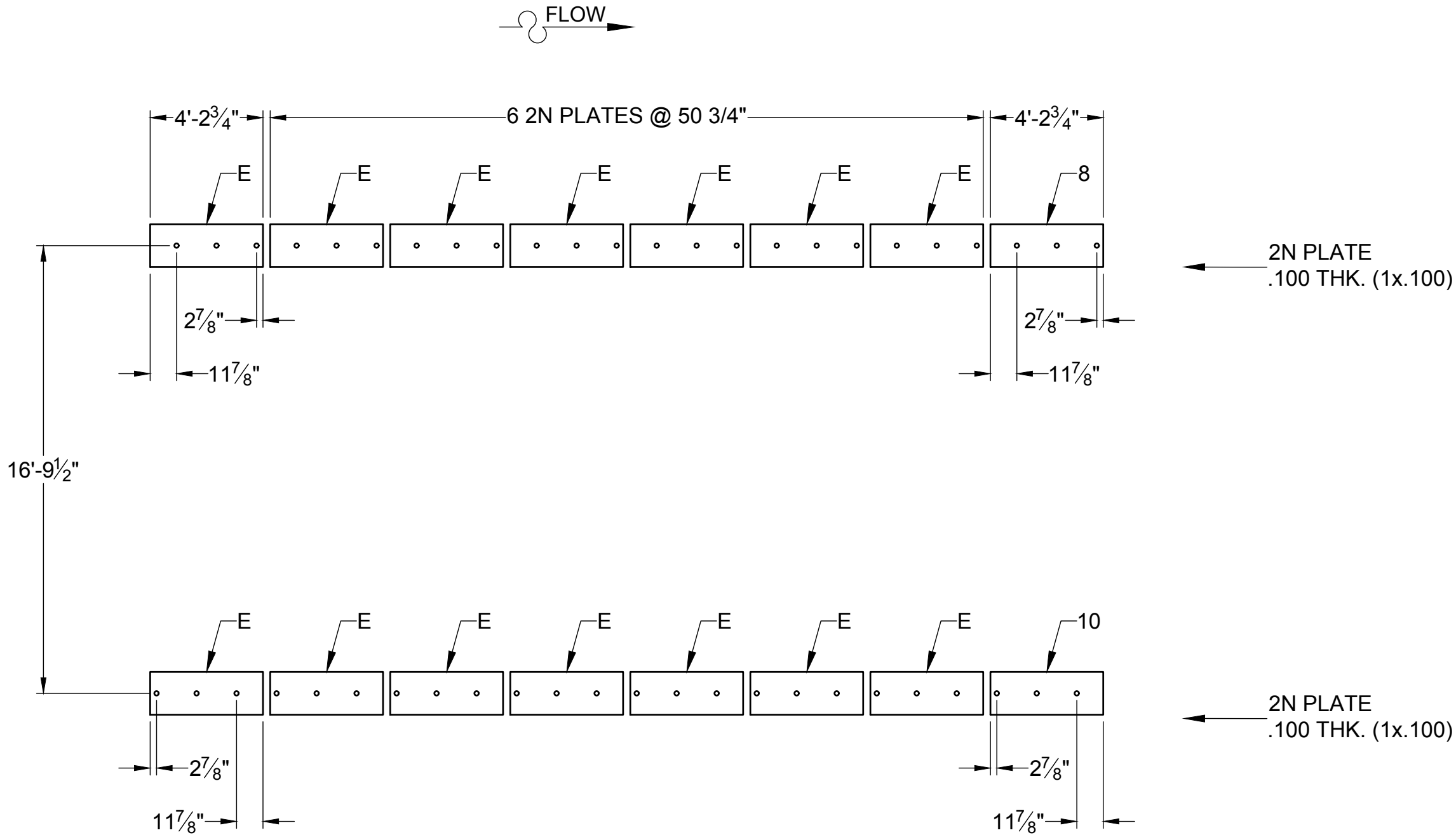
CONTECH
STRUCTURAL PLATE
CONTECH
CONTRACT
DRAWING

BOY SCOUT LAKE BOX CULVERT

KODIAK, AK

PROJECT No.: 586272	SEQ. No.: 010	DATE: 3/27/2018
DESIGNED:	DRAWN: JSC	
CHECKED:	APPROVED:	
SHEET NO.: 2 OF 5		

\\AD\CONTECH-CPL\COM\ROOT\MERLIN\PROJECT\ACTIVE\586272\10-ALUMINUM BOX CULVERT\DRAWINGS\CONTRACT\586272-010-AL-CON-A.DWG 3/27/2018 9:49 AM



ALBC - SUPPLEMENTAL PLATES PLAN VIEW

NOTE 1: 2-7/8" DIM. EDGE OF PLATES RED
NOTE 2: 3-1/4" GAP TYP. BETWEEN PLATES

TYPE: BOX SIZE: 37A6 SPAN: 16'-6" RISE: 6'-8" LENGTH @ 1": 36'-0"		INLET	OUTLET	PLATE THICKNESS: .150 (H).125(C) REINFORCING RIB SPACING: AS SHOWN REINFORCING RIB TYPE: AS SHOWN NUMBER OF STRUCTURES: 1
	SKEW	0	0	
	BEVEL	0	0	

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY




ENGINEERED SOLUTIONS LLC

www.ContechES.com

700 Tech Drive, Winchester, KY 40391

859-744-3339 859-744-9665 FAX



STRUCTURAL PLATE

CONTECH
CONTRACT
DRAWING

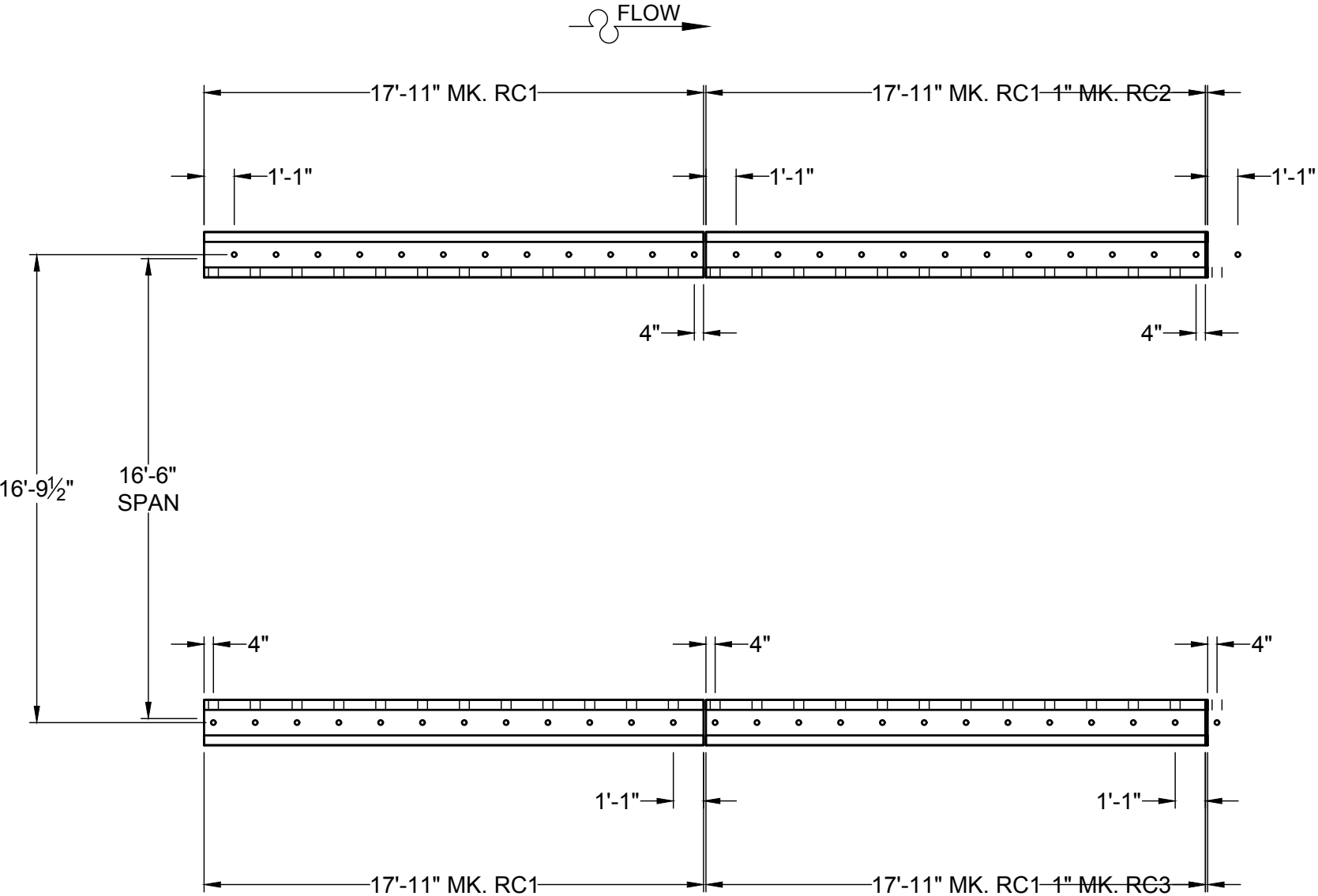
FOR APPROVAL

BOY SCOUT LAKE BOX CULVERT

KODIAK, AK

PROJECT No.: 586272	SEQ. No.: 010	DATE: 3/27/2018
DESIGNED:	DRAWN: JSC	
CHECKED:	APPROVED:	
SHEET NO.: 3 OF 5		

I:\AD\CONTECH-CPL\COM\ROOT\MERLIN\PROJECT\ACTIVE\586272-10-ALUMINUM BOX CULVERT\DRAWINGS\CONTRACT\586272-010-AL-CON-A.DWG 3/27/2018 9:49 AM



ALBC - RECEIVING CHANNEL PLAN VIEW

NOTE: 1" GAP BETWEEN ADJACENT RECEIVING CHANNELS

TYPE: BOX SIZE: 37A6 SPAN: 16'-6" RISE: 6'-8" LENGTH @ 1': 36'-0"		INLET	OUTLET	PLATE THICKNESS: .150 (H).125(C) REINFORCING RIB SPACING: AS SHOWN REINFORCING RIB TYPE: AS SHOWN NUMBER OF STRUCTURES: 1
	SKEW	0	0	
	BEVEL	0	0	

FOR APPROVAL

CONTECH

ENGINEERED SOLUTIONS LLC

www.ContechES.com

700 Tech Drive, Winchester, KY 40391

859-744-3339 859-744-9665 FAX

CONTECH

STRUCTURAL PLATE

CONTECH

CONTRACT

DRAWING

BOY SCOUT LAKE BOX CULVERT

KODIAK, AK

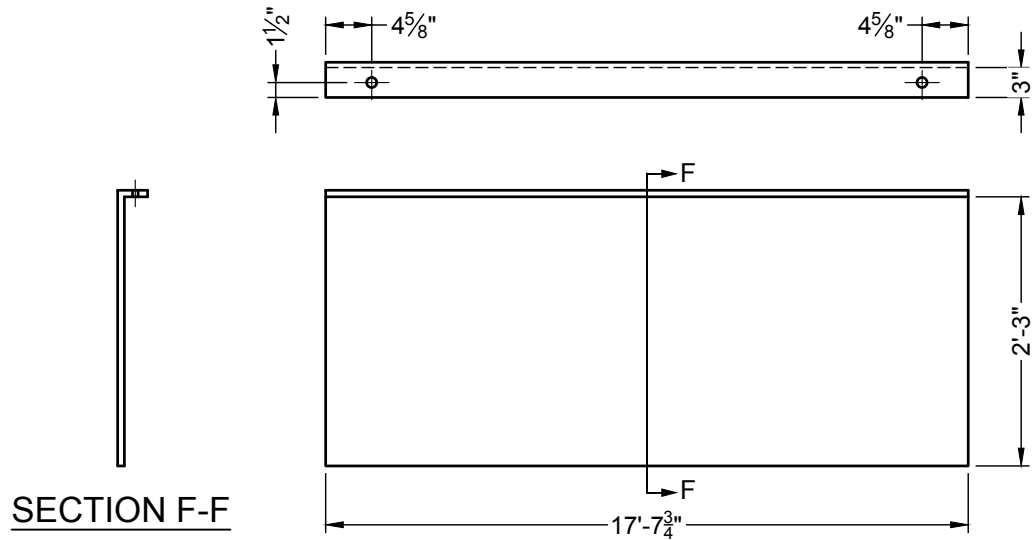
The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY

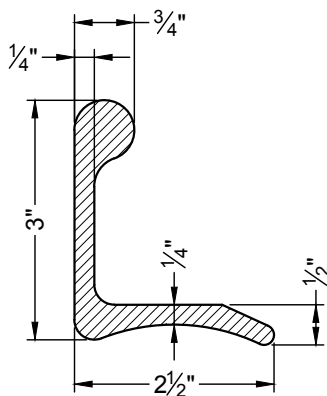
PROJECT No.: 586272	SEQ. No.: 010	DATE: 3/27/2018
DESIGNED:	DRAWN: JSC	
CHECKED:	APPROVED:	
SHEET NO.: 4 OF 5		

\\AD.CONTECH-CPL.COM\ROOT\MERLIN\PROJECT\ACTIVE\586272-10-ALUMINUM BOX CULVERT\DRAWINGS\CONTRACT\586272-010-AL-CON-A.DWG 3/27/2018 9:49 AM

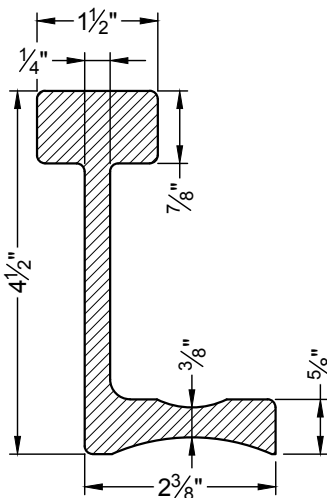


SECTION F-F

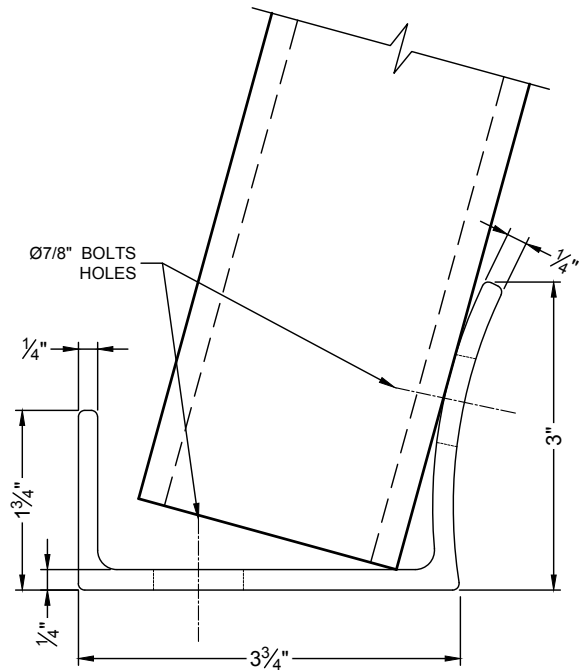
TYPICAL TOE WALL
(BOTH ENDS)



TYPE II RIB (CONTECH)	TYPE 1 RIB (ASTM)
ALLOY	6061-T6
YIELD STRENGTH	35 KSI [241.3 MPa]
TENSILE STRENGTH	38 KSI [262.0 MPa]
AREA	1.71IN. ² [1103 mm ²]
CENTER OF AREA	Y _c = 1.02 IN. [26.0mm]
PLASTIC MODULUS	1.70 IN. ³ [27,858mm ³]
PLASTIC MOMENT	M _p = 4.97 [6.72 KN-M]



TYPE VI RIB (CONTECH)	TYPE 3 RIB (ASTM)
ALLOY	6061-T6
YIELD STRENGTH	35 KSI [241.3 MPa]
TENSILE STRENGTH	38 KSI [262.0 MPa]
AREA	3.62IN. ² [2335 mm ²]
CENTER OF MASS Y	Y _c = 2.27 IN. [57.6mm]
SECTION MODULUS	4.38 IN. ³ [71,775mm ³]
PLASTIC MODULUS	5.66 IN. ³ [92,750mm ³]
PLASTIC MOMENT	M _p = 16.52 [22.41 KN-M]



ALUMINUM RECEIVING CHANNEL

TYPE: BOX SIZE: 37A6 SPAN: 16'-6" RISE: 6'-8" LENGTH @ 1': 36'-0"		INLET	OUTLET	PLATE THICKNESS: .150 (H).125(C) REINFORCING RIB SPACING: AS SHOWN REINFORCING RIB TYPE: AS SHOWN NUMBER OF STRUCTURES: 1
	SKEW	0	0	
	BEVEL	0	0	

FOR APPROVAL

BOY SCOUT LAKE BOX CULVERT

KODIAK, AK

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Contech Engineered Solutions LLC ("Contech"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Contech. Failure to comply is done at the user's own risk and Contech expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

MARK	DATE	REVISION DESCRIPTION	BY

CONTECH
ENGINEERED SOLUTIONS LLC
www.ContechES.com
700 Tech Drive, Winchester, KY 40391
859-744-3339 859-744-9665 FAX

CONTECH
STRUCTURAL PLATE
CONTECH
CONTRACT
DRAWING

PROJECT No.: 586272	SEQ. No.: 010	DATE: 3/27/2018
DESIGNED:	DRAWN: JSC	
CHECKED:	APPROVED:	
SHEET NO.: 5	OF 5	