

ALUMINUM STRUCTURAL PLATE SPECIFICATIONS

1.0 GENERAL

- 1.1 This specification covers the design and manufacturing of corrugated aluminum structural plate structures or aluminum box culverts.
- 1.2 Qualified Suppliers
- (a) Qualified suppliers must have at least fifteen (15) years experience fabricating equal or larger type structures.
- (b) The supplier must provide the following documentation with their bid:
- Product Literature
 - Documentation to ensure product is in compliance with these specifications.
- (c) The supplier must provide the following documentation post bid:
- Project specific representative drawings with material, complete design calculations and design specification references.

2.0 DIMENSIONS

- 2.1 **Pellicer Culverts (2) – see attached drawing for existing structure dimensions**
Minimum Opening Area: 33 SF
Span: Maximum span: 13 FT
Rise: Maximum rise: 3 FT
Approximate Length: 36 FT - based on 14 foot top width and 2:1 side slopes. Actual length can vary 10% depending on structure chosen.
Maximum fill above center of culvert: 2.0 FT
- 2.2 **Lake Norris Culvert (1) – see attached drawing for existing structure dimensions**
Minimum Opening Area: 103.5 SF
Span: Maximum span: 30 FT
Rise: Maximum rise: 5.75 FT
Approximate Length: 45 FT – based on 14 foot top width and 2:1 side slopes.
Actual length can vary 10% depending on structure chosen.
Maximum fill above center of culvert: 2.5 FT

The actual dimensions of the culvert to be determined by supplier as long as above criteria met. The height of the footer shall not be used in determining the Rise i.e. the top of the footer will be constructed at or near finish grade of the creek bed.

- 2.3 **Thickness:** Plate properties shall conform to Table 1.
- 2.4 **Ribs:** Reinforcing ribs shall be Type II, Type IV or Type VI as required by curving radii and plate and rib composite section properties in Table 2.
- 2.5 **Corrugation:** The Aluminum Structural Plate shall have 9-inch x 2-1/2 inch annular corrugations or approved equal. The corrugation profile shall have AASHTO recognition for a minimum of 15 years.

3.0 DESIGN

- 3.1 **Design Criteria:** The design of the structure shall be in accordance with: AASHTO Standard Specification For Highway Bridges 17th Edition with interim revisions Section 12 Working Stress Design.
- 3.2 **Design Loads:** Design loads shall be HL-93. Construction loads and any temporary loads exceeding the service live load are not allowed on the structure without approval from the Engineer.
- 3.3 **Shop Drawings:** Shop drawings and design calculations shall be prepared and submitted to the owner for approval after bid has been awarded.
- 3.4 **Aluminum Box Culverts:** Shall conform to ASTM B864.

4.0 MATERIALS

- 4.1 **Structural Plate:** Aluminum Structural Plate shall consist of plate, ribs and appurtenant items and shall conform to the requirements of AASHTO M219 or ASTM B746 and Table 1

Table 1 – ALUMINUM STRUCTURAL PLATE - 9x2-1/2 Corrugated Plate Section Properties

Nominal Thickness (in)	Moment of Inertia (in ⁴ /ft)	Section Modulus (in ³ /ft)	Radius of Gyration (in)	Area of Section (in ² /ft)
*0.100	0.997	0.767	0.844	1.404
0.125	1.248	0.951	0.844	1.750
0.150	1.499	1.131	0.845	2.100
0.175	1.751	1.309	0.845	2.449
0.200	2.004	1.484	0.846	2.799
0.225	2.258	1.657	0.847	3.149
0.250	2.513	1.828	0.847	3.501

*0.100 inch thick plate shall be used for un-curved elements only.

Table 2 – ALUMINUM STRUCTURAL PLATE/RIB Composite Section Properties

Metal Thickness (inches)						
Rib Type @ Spacing	0.125	0.150	0.175	0.200	0.225	0.250
Plastic Moment Capacity, Mp (kip-ft/ft)						
No Rib	2.65	3.18	3.71	4.24	4.77	5.30
Type II @ 54	4.62	5.46	6.04	6.61	7.17	7.74
@ 27	6.18	7.25	7.94	8.60	9.25	9.87
@ 18	7.41	8.66	9.48	10.26	11.00	11.71
@ 9	10.63	12.13	13.08	14.05	15.03	16.02
Type IV @ 54	5.87	6.82	7.43	8.04	8.63	9.21
@ 27	8.32	9.59	10.39	11.14	11.85	12.55
@ 18	10.42	11.90	12.84	13.72	14.57	15.39
@ 9	16.45	18.46	19.41	20.38	21.37	22.37
Type VI @ 54	8.74	9.51	10.24	10.95	11.64	12.32
@ 27	13.76	14.33	15.16	16.19	17.36	17.48
@ 18	20.09	20.56	20.79	21.30	21.74	22.58
@ 9	32.24	34.35	36.46	38.54	39.88	40.63

- 4.2 **Aluminum Alloy - Plate:** Plates shall be fabricated from 5052-H141 aluminum alloy conforming to AASHTO M219 or ASTM B209.
- 4.3 **Aluminum Alloy – Ribs:** Ribs shall be fabricated from 6061-T6 aluminum alloy conforming to ASTM B221.
- 4.4 **Fasteners:**
 - 4.4.1 Steel Nuts and bolts shall conform to the requirements of ASTM A 307 or ASTM A 449.
 - 4.4.2 Aluminum nuts and bolts (if required) shall conform to ASTM B746. The structural design shall conform to the provisions of AASHTO Standard Specifications for Highway Bridges Section 12.6.2.
- 4.5 **Field Applied Bituminous (Asphalt) Coating:** If specified, field applied bituminous coating shall conform to AASHTO M190.

5.0 FABRICATION AND QUALITY CONTROL

- 5.1 Final manufacturing processes including corrugating, punching, curving, special fabrication and optional zinc priming shall be performed in the United States of America at a common location.
- 5.2 All raw materials shall be traceable and certified by the mill for material composition and physical properties.

6.0 INSTALLATION (Not Part of this Bid)

- 6.1 **Assembly:** The structure shall be assembled in accordance with the shop drawings and plate layout provided by the manufacturer. Bolts shall be tightened to an applied torque between 100 and 150 ft-lbs.
- 6.2 **Installation:** The structure shall be installed in accordance with AASHTO Standard Specifications for Highway Bridges Section 26 or ASTM A807, the plans and specifications, and the manufacturer's recommendations.