

MULTI-PLATE® 6x2 CORRUGATED GALVANIZED STEEL STRUCTURAL PLATE SPECIFICATIONS

1.0 GENERAL

- 1.1 This specification covers the design, manufacturing and installation of the MULTI-PLATE galvanized 6x2 corrugated steel structural plate structure detailed in the plans.
- 1.2 Qualified Suppliers
- (a) Each bidder is required to identify their intended bridge supplier as part of the bid submittal. Qualified suppliers must have at least fifteen (15) years experience fabricating equal or larger type structures.
- (b) Pre-Approved Manufacturer:
Contech Engineered Solutions LLC
700 Tech Drive
Winchester, KY 40391
- (c) Suppliers other than those listed above may be used provided the owner's agent evaluates the proposed supplier and approves the supplier 14 business days prior to bid.
- (d) The contractor must provide the following documentation, for any proposed Supplier who is not pre-approved, at least 14 business days prior to bid:
- Product Literature
 - All documentation to ensure substitution will be in compliance with these specifications.
 - Project specific representative drawings for bridge projects listed above with material, complete design calculations and design specification references.
- (e) Proposed suppliers must have at least fifteen (15) years experience designing these types of structures and a minimum of fifteen (15) successful projects, of similar shape and construction as specifically written in these specifications and drawings, each of which has been in service at least three (3) years. List the location, shape, size, owner, and a contact for reference for each project.
- (f) The owner's agent will evaluate and verify the accuracy of the submittal prior to bid. If the owner's agent determines that the qualifying criteria have not been met, the contractor's proposed supplier shall be rejected. This ruling shall be final.
- 1.3 The required structure will be designated by standard applicable catalog structure number, span, rise and plate Pi.
- 1.4 Pi shall equal 3.2 inches.
- 1.5 Cover over the structure shall be determined from the crown of the structure to the bottom of flexible pavement or top of rigid pavement.

2.0 DIMENSIONS

- 2.1 **Span:** Maximum span shall be ____ ft - ____ in
 Bottom span shall be ____ ft - ____ in
 Span shall be determined at the inside corrugations
- 2.2 **Rise:** Total rise shall be ____ ft - ____ in
 Top rise shall be ____ ft - ____ in (from spring line to crown)
 Rise shall be determined at the inside corrugations
- 2.3 **Gage:** Plate gage shall be ____ gage (____ in) for all plates or as described
- 2.4 **Corrugation:** The MULTI-PLATE galvanized structural plate shall have 6 inch x 2 inch annular corrugations. The corrugation profile shall have AASHTO recognition for a minimum of 15 years.

3.0 DESIGN [specifier: choose one]

- 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.
 - AASHTO LRFD Bridge Design Specifications 2012 Section 12 Load Resistance Factor Design.
 - AISI Handbook of Steel Drainage & Highway Construction Products 1994 Edition Working Stress Design.
 - AREMA Manual for Railway Engineering 2012 Edition Working Stress Design
 - ASTM A796 Standard Practice for Structural Design of Corrugated Steel Pipe, Pipe-Arches and Arches for Storm and Sanitary Sewers and Other Buried Applications.
- 3.2 **Design Loads:** Design loads shall be specified by the Engineer. Construction loads and any temporary loads exceeding the service live load are not allowed on the structure without approval from the Engineer.
- (a) The Engineer shall specify the materials and extents of the foundations or bedding and backfill material within the critical backfill zone with consideration of structure shape and in situ conditions.
- (b) The Engineer shall consider the structural capacity of trench walls or adjacent embankments to provide balanced soil loads on the structure.
- (c) The Engineer shall consider hydraulic forces on the ends of the structure. End treatment such as headwalls, slope collars, slope paving or cut-off walls shall be considered to protect the backfill and provide stability and protection to the ends of the structure as well as to prevent erosion or washout.
- (d) The Engineer shall consider scour effects on the structure foundation. The use of scour counter-measures shall be considered for strip footings. The Engineer shall consider potential washout/undermining effects on the invert. The use of a toewall at the ends of a structure or a paved invert shall be considered.

- 3.3 **Shop Drawings:** Shop drawings and design calculations shall be prepared and submitted to the owner for approval. The contractor shall be responsible for verification of all field dimensions prior to fabrication.

4.0 MATERIALS

- 4.1 **Structural Plate:** MULTI-PLATE galvanized steel structural plate shall consist of plate and appurtenant items as shown on the plans and shall conform to the requirements of AASHTO M167 or ASTM A761 and Table 1

Table 1 – MULTI-PLATE - 6x2 Corrugated Structural Plate Section Properties

Gage	Nominal Thickness (in)	Uncoated Thickness (in)	Moment of Inertia (in ⁴ /in)	Section Modulus (in ³ /in)	Radius of Gyration (in)	Area of Section (in ² /ft)
12	0.111	0.1046	0.0604	0.0574	0.682	1.556
10	0.138	0.1345	0.0782	0.0733	0.684	2.003
8	0.168	0.1644	0.0962	0.0888	0.686	2.449
7	0.188	0.1838	0.1080	0.0989	0.688	2.739
5	0.218	0.2145	0.1269	0.1147	0.690	3.199
3	0.249	0.2451	0.1462	0.1302	0.692	3.658
1	0.280	0.2758	0.1658	0.1458	0.695	4.119
5/16	0.318	0.3125	0.1900	0.1640	0.698	4.671
3/8	0.380	0.3750	0.2320	0.1950	0.704	5.613

- 4.2 **Hot Dip Galvanizing:** Galvanizing shall conform to AASHTO M111 or ASTM A153
- 4.3 **Fasteners:** Nuts and bolts shall conform to AASHTO M232 and M291 or ASTM A449, Type 1 (bolts) and A563, Grade C (nuts).
- 4.4 **Bituminous (Asphalt) Coating:** If specified, bituminous coating shall conform to AASHTO M190.

5.0 FABRICATION AND QUALITY CONTROL

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

6.0 INSTALLATION

- 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 300 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 project plans and specifications, and the manufacturer's recommendations.
- (a) The Contractor shall provide footings as required per the project plans and specifications.

(b) The Contractor shall provide proper bedding and backfill to avoid distortion that may create undesirable stresses in the structure and/or settlement of the roadway. The bedding shall be free of rock formations, protrusions, frozen material or organic material.

6.3 **Backfill:** The structure shall be backfilled using clean, well graded granular materials that meet the requirements of AASHTO M145 soil classifications A-1, A-2 or A-3.

(a) Backfill materials shall be placed in symmetrical lifts on each side of the structure. The differential between the lifts on either side shall not exceed 24 inches. Each layer of soil shall be placed in 6 to 8 inch loose lifts and compacted to a minimum of 90% density per AASHTO T99 or ASTM D698 (Standard Proctor).

(b) Backfill soils shall be free of rocks exceeding 3 inches, frozen lumps, ice, organic matter and foreign materials that could cause hard spots or decompose to create voids.

(c) The presence of a high percentage of silt or fine sand in the native soils suggests the need for well-graded granular material in the critical backfill zone or the use of non-woven geotextile to prevent soil migration.

(d) During backfilling operations, only small tracked construction equipment (such as a D-4 dozer or smaller) shall be near the structure as fill progresses above the crown and to the minimum height of cover. After adequate cover and compaction is achieved, live loads may increase at the direction of the Engineer.

6.4 **Critical Backfill Zone:** The Engineer shall determine the extents of the critical backfill zone and provide a detail on the plans.

Revised April 2013