Specification for Galvanized Steel LONG SPAN Structures

6” x 2” Steel Structural Plate

General Description

The LONG SPAN steel structural plate structure, conforming to the dimensions shown on the plans and specifications, shall be installed at the location designated. The design and installation shall conform to AASHTO Standard Specifications for Highway Bridges, Division I, “Soil-Corrugated Metal Structure Interaction Systems”, Section 12.7, “LONG SPAN Structural Plate Structures”, and Division II, Section 26, “Metal Culverts” and Division II, Section 8, “Concrete Structures”.

Materials

The galvanized steel structural plate shall have 6” x 2” corrugations and shall be of the gage as shown on the plans. The plates shall be manufactured in conformance with AASHTO Specification M 167. Bolts and nuts shall meet the provisions of ASTM A 449, Type 1 and ASTM A 563, Grade C, respectively. The steel anchor bolts shall conform to ASTM A307, Grade A.

Longitudinal Structural Stiffeners

Longitudinal stiffeners shall be located at the radius transition at the ends of the top arc. These stiffeners shall consist of reinforced concrete conforming to Division II, Section 8, Class B of the AASHTO Standard Specifications for Highway Bridges having a minimum compressive strength of 2400 psi. Reinforcing steel shall conform to ASTM A 615, Grade 40, having a minimum yield strength of 40,000 psi. The longitudinal stiffeners shall be formed and poured conforming to the plan dimensions when the backfill reaches the bottom elevation of the longitudinal stiffeners.

Design

The LONG SPAN structure shall be designed in accordance with the latest AASHTO design criteria and shall be required to incorporate the use of continuous longitudinal structural stiffeners. The foundation, structural backfill and end treatment shall be as required herein and detailed on the plans.

Structure Assembly

The structure shall be assembled in strict accordance with the LONG SPAN Bridge & Culvert’s instructions and to the design shape shown on the plans. Plates shall be assembled according to the plate assembly drawings supplied by LONG SPAN Bridge & Culvert.

Structural Backfill

Material

A granular type of material shall be used around and over the structure. This select structural backfill material shall conform to one of the following classifications of soil from AASHTO Specification M-145, as modified in the following table for

<table>
<thead>
<tr>
<th>GROUP CLASSIFICATION</th>
<th>A-1-a</th>
<th>A-1-b</th>
<th>A-2-4</th>
<th>A-2-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Analysis, Percent Passing:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 10 (2.00 mm)</td>
<td>50 Max.</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>No. 40 (0.425 mm)</td>
<td>30 Max.</td>
<td>50 Max.</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>No. 100 (0.150 mm)</td>
<td>—</td>
<td>50 Max.</td>
<td>50 Max.</td>
<td>—</td>
</tr>
<tr>
<td>No. 200 (0.075 mm)</td>
<td>15 Max.</td>
<td>25 Max.</td>
<td>20 Max.</td>
<td>20 Max.</td>
</tr>
</tbody>
</table>

Characteristics of Fraction Passing No. 40 (0.425 mm)

<table>
<thead>
<tr>
<th>Liquid Limit</th>
<th>40 Max.</th>
<th>41 Min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasticity Index</td>
<td>6 Max.</td>
<td>10 Max.</td>
</tr>
<tr>
<td>Usual Types of Significant Constituent Materials</td>
<td>Stone Fragments</td>
<td>Silty or Clayey Gravel and Sand</td>
</tr>
</tbody>
</table>

* Modified to be more select than M-145

Additional Requirements

1. Materials must be dense graded (open graded or gap graded materials are not allowed).
2. Fine beach sands, windblown sands, stream deposited sands exhibiting fine, rounded particles and typically classified by AASHTO M145 as A-3 materials are not allowed.
3. On site mixing or blending to achieve specified gradation is not allowed.
Maximum particle size shall not exceed 3 inches. For the A-2 materials, moisture content must be between -3% to +2% optimum as defined by AASHTO T-180. All soil classifications are limited in height of cover and structure shape applications as follows:

- A-1-a material is suitable for all LONG SPAN shapes, sizes and fill heights.
- A-1-b material is suitable only for use with high profile arch and pear shape structures to a 12' maximum fill height and for use with elliptical and low profile arch structures to a 20' maximum fill height.
- A-2-4 and A-2-5 materials are restricted to maximum heights of cover of 12'. These materials are not allowed for use with pear, pear arch and high profile arches with more than 10 N in the side arc.

Other backfill materials which provide equivalent structural properties, long term, in the environmental conditions expected (saturation, freeze-thaw, etc.) may be used. Such materials shall be approved only after thorough investigation and testing by a soils engineer familiar with the requirements for structural backfill of LONG SPAN structures.

**Backfill Envelope Limits**

The backfill envelope limits are as detailed on the plans.

**Backfill Placement**

Before backfilling, the erected structure shall meet the tolerance and symmetry requirements of AASHTO and LONG SPAN Bridge & Culvert. Approved backfill material shall be placed in horizontal, uniform layers not exceeding 8" in thickness, before compaction, and shall be brought up uniformly on both sides of the structure. Each layer of backfill shall be compacted to a relative density of not less than 90%, modified proctor per AASHTO Test Method No. T-180. Field density tests of compacted backfill will be made at regular intervals during backfill.

LONG SPAN structures, due to their size and shape, are sensitive to the types and weights of equipment used to place and compact the select backfill material. This is especially critical in the areas immediately adjacent to and above the structure. Therefore, equipment types will be restricted in those critical zones. Compaction equipment or methods that produce horizontal or vertical earth pressures which cause excessive distortion or damage to structures shall not be used.

Contractors should plan to have a D4 (approximately 20,000 lbs.) or similar weight tracked dozer to place and grade backfill immediately alongside and above the structure until minimum cover level is reached. Lightweight vibratory plate or roller type compaction equipment must be used to compact the backfill in these zones. Use of heavier equipment and rubber tired equipment such as scrapers, graders and front end loaders will likely be prohibited inside the select fill envelope zone until appropriate minimum cover height has been obtained.

**Shape Control Monitoring**

LONG SPAN BRIDGE & CULVERT shall provide a Shape Control Technician who is a qualified representative of a professional soils engineering firm, or other qualified organization, to ensure properly shaped structure. The Shape Control Technician shall take initial measurements of the erected structure before backfilling, observe all backfill materials, their placement and record compaction densities. He shall record all density readings and ensure they meet the requirements of the plans and specifications. However, in no case shall the relative densities be less than 90% per AASHTO T-180. The Shape Control Technician shall monitor the structure shape during the placement of structural backfill to the minimum cover height over the structure. No structural backfill shall be placed without the Shape Control Technician on site.

The Shape Control Technician shall:

- Monitor the structure's shape throughout the backfilling operation and report shape change rates to the contractor.
- Contact a LONG SPAN Bridge & Culvert representative immediately if there are problems in meeting the established tolerances.
- Have full authority to stop backfill work if necessary.

**Preconstruction Conference**

Prior to construction, a meeting will be held to review the construction procedures. A qualified representative of LONG SPAN Bridge & Culvert will be present to discuss methods and responsibility for shape monitoring and control, backfill material selection, testing and placement, and compaction methods and testing. A representative of the Engineer, Prime Contractor, and any involved Sub-Contractors must be present.