

SPECIAL SPECIFICATION

4223

Steel Sandwich Plate Bridge Deck System

1. **Description.** Design, fabricate and install a prefabricated Steel Sandwich Plate System (a solid elastomeric material between two steel plates forming a steel sandwich panel) used for the construction of a bridge deck system. This Item does not govern the construction of the riding surface or bridge substructure, including abutments, bents, and foundation.
2. **Design Documentation.** Demonstrate the ability to design and fabricate steel sandwich plate bridge deck systems that provide quality workmanship, detailing, structural integrity, and satisfactory aesthetics by submitting the design documentation, prepared by a licensed professional Engineer, to the Department for approval prior to the start of fabrication. Include all information regarding design, material selection, fabrication and installation including, but not limited to:
 - Design, assumptions and methodology
 - Listing of materials to be used including method and site of manufacture, and suppliers of components
 - Welding procedures
 - Evidence of selected manufacturer's ability to produce the core material in accordance with the design specification
 - Repair procedures for elastomer voids
 - Installation procedures (transit, welding, distortion control, and installation sequence).

Submit 6 complete copies of the shop drawings and design documentation for review and approval. Give the Engineer at least 28 calendar days to review and approve each submittal. Include unique drawings that illustrate specific portions of the work to be done. Clearly show all relevant design information such as member sizes, material selections and connections.

3. **Materials.** Use materials that meet requirements of the following Items:
 - Item 441, "Steel Structures"
 - Item 442, "Metal for Structures"
 - Item 447, "Structural Bolting"
 - Item 448, "Structural field Welding"

Furnish external steel layers, perimeter bars and core material meeting the requirements shown below:

- A. External Steel Layers.** Furnish external steel layers (top and bottom) of the grade and designation shown in the design.
- B. Perimeter Bars.** Furnish perimeter bars of the grade and designation shown in the design.
- C. Core Material.** Furnish non-metallic core materials shown in the design that have been tested and certified in accordance with the requirements shown below:
- 1. Raw Elastomer Properties.** Conduct tests on the base components. Base components are to be provided with unique identifications by the manufactures. Provide certificates of conformity for each batch of material supplied indicating the relevant values specified in the approved design. Ensure copies of certificates of conformity (which must indicate the actual tested values) are obtained for batches of materials received.
 - 2. Mixed Elastomer Properties.** Mix the base components and inject the mix to form the elastomer according to a written procedure approved by the Engineer. Cure and test samples of the elastomer in accordance with the procedures and test properties.
 - 3. Cured Elastomer Properties.** Provide certified test results meeting the design requirements for the following properties:
 - Density
 - Hardness (Shore D)
 - Shear modulus
 - Tensile stress
 - Tensile strain to failure
 - Bond shear strength

Test in accordance with the elastomer manufacturer's recommendations to the requirement for design. Reject material not meeting the criteria.

- 4. Fabrication.** Fabricate a prefabricated Steel Sandwich Plate System in accordance with the following:
- Item 441, "Steel Structures"
 - Item 442, "Metal for Structures"
 - Item 447, "Structural Bolting"

The manufacturer must be prequalified, based on an inspection of the facilities and review of the quality control procedures. Weld and inspect in accordance with AASHTO/AWS D1.5, "Bridge Welding Code" and as modified herein. Perform Magnetic Particle (MT) testing on 100% and Ultrasonic Testing (UT) on 50% of all welds except for complete penetration groove welds (CJP). The Engineer will determine locations for the UT testing.

- A. Panel Shell Manufacturing.** Manufacture panels in accordance with Item 441, "Steel Structures" as modified by the following:

- Prepare top and bottom plates for panels to the required dimensions in accordance with the manufacturer's recommendations. Use full-size plates unless otherwise allowed by the Engineer. At a minimum, prepare inner surface of steel cavity and assure surfaces are to be clean and dry, free from surface rust, degreased and grit free. A minimum surface roughness of 60 microns is to be achieved on the bonding surfaces before injection of elastomer.
- Prepare and weld perimeter bars to the bottom plate in accordance with the approved design documentation to form the cavity walls. Grind smooth any welds in way of the perimeter bars.
- Maintain the required core thickness by use of spacers made of steel or elastomer arranger on the bottom plate in accordance with the design documentation.
- Minimize lifting operations such that the steel plate panels are subjected to minimal distortion and unnecessary loads. Adequately support panels until the injected elastomer has cured to avoid distortion. Maintain flatness requirements of the design documentation.
- Complete all welding if the panels cavity being injected and cavities immediately adjacent prior to any elastomer injection.

B. Elastomer Injection.

- Locate venting and injection holes in the top plate as shown on the design documentation.
- Prior to any injection, determine the relative humidity in the cavity to confirm freedom from moisture. Include the process and the method as part of the design documentation.
- Perform injection when the cavity meets the moisture criteria and when the top and bottom plates maintain a temperature of not less than 145°F. Required temperature may be maintained by use of thermal blankets or other approved methods.
- Provide continuous monitoring of the volume of injected elastomer versus the volume of remaining void space.
- Start and complete injection of elastomer into the cavity within the time limits specified in the design documentation.

C. Post Elastomer Injection.

- After completion of the injection, obtain samples of the injected elastomer to test and verify properties. For each panel test a minimum of one sample for Shore D Hardness testing.
- Seal the injection and venting holes in an approved manner.
- Determine the size and extent of any voids found in the elastomer.
- Repair all voids larger than maximum allowable void size as defined in the design documentation.
- Notify the Engineer before performing any repairs. Use the approved repair procedure outlined in the design documentation.

5. **Construction.** Erect the steel sandwich plate system panels in accordance with the design procedures, the plans, Item 447, “Structural Bolting” and Item 448, “Field Welding”.

Take necessary precautions when transporting or lifting the completed steel sandwich plate system panels to avoid distortion and maintain flatness requirements of the design.

Before the start of any field welding, furnish a written installation and welding sequence procedure to account for shrinkage and distortion control. Take necessary precautions or use an approved heat-sink device to avoid heating the finished Steel Sandwich Plate System panels in excess of 420°F at any time, especially during welding.

Perform Magnetic Particle (MT) testing on 100% and Ultrasonic Testing (UT) on 50% of all welds except for complete penetration groove welds (CJP). The Engineer will determine locations for the UT testing.

6. **Measurement.** This Item will be measured by the square foot of steel sandwich plate bridge deck system in the completed and accepted final position.
7. **Payment.** The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price bid for “SPS Deck”. This price is full compensation for design, fabrication, testing, transport, erection, and for equipment, labor, tools, and incidentals.