

PREFABRICATED BRIDGE UNIT SUPERSTRUCTURE

****From Warren BRF 013-4(32)**

- xx. DESCRIPTION. This work shall consist of manufacturing, transporting, and erecting concrete/steel composite prefabricated bridge units (PBU's) as shown on the Plans. The work shall also include connecting the units into a monolithic superstructure through use of closure pours as shown on the Plans.

The work under this Section shall be performed in accordance with these provisions, the Plans, and Sections 501, 506, 507, and 508 of the Standard Specifications.

- xx. MATERIALS. Materials shall meet the requirements of Subsections 501.02, 506.02, 507.02, 508.02, and the following:

Concrete Repair Material.....780.01-780.04

- xx. GENERAL FABRICATION REQUIREMENTS. The structural steel furnished under this Section shall be fabricated in a plant meeting the requirements of Subsection 506.03. After fabrication, the structural steel shall be transported to a location, approved by the Agency, where the remainder of the composite superstructure unit shall be fabricated.

The Fabricator or Contractor constructing the reinforced concrete portion of the PBU's shall:

- (a) have demonstrated experience in forming, casting, curing, and finishing High Performance Concrete superstructure decks in accordance with Section 501;
- (b) adequately prepare and submit for approval a Quality Control Plan and erection/lifting plan(s) specific to the member detailed.

- xx. SUBMITTALS. As soon as practical after award of the Contract, all required information shall be prepared and submitted by the Contractor or Fabricator(s). Submittals shall be in accordance with Subsection 105.03 and shall include the following:

- (a) Structural Steel. In accordance with Subsection 506.04.
- (b) Concrete. In accordance with Subsection 540.04, with the exception that when the PBU's have been designed by the Agency and no modifications to that design are being made by the Fabricator or Contractor, no structural design calculations are required.
- (c) Reinforcing Steel. In accordance with Subsection 507.03.

- xx. INSPECTION. Structural steel shall be inspected by the Agency in accordance with Subsection 106.04 and Section 506.

Concrete elements furnished and the work performed herein shall be inspected by the Agency. The inspector shall have the authority to reject any material or work that does not meet the requirements of these Specifications. Advance notification of at least two (2) weeks

must be provided by the Contractor to the Agency's Engineer and the Structural Concrete Engineer concerning the proposed intention to commence work. A minimum of five (5) working days notification must be provided to the Structural Concrete Engineer by the Contractor to confirm the fabrication start date.

Prior to placing any concrete elements produced under these Specifications, the Materials and Research Engineer shall have approved all applicable material certifications required in accordance with Subsection 700.02.

xx. FABRICATION.

- (a) Forming Members. Forms shall be well constructed, carefully aligned, clean, substantial, and firm, and securely placed and fastened together to provide a level, true riding surface. The adjustable supports and deflection control shall be checked by the Fabricator's engineer prior to pouring and monitored throughout the pouring process. Any defects or damage due to form work, stripping, or handling may be cause for rejection. Holes, cutouts, anchorage, reinforcement, and any other related details shown on the Plans shall be provided for in the members.

The form finish shall be in accordance with the approved Fabrication Drawings.

Relative bearing elevations shall be within $\pm 0.01'$ of that shown on the Plans.

- (b) Structural Steel. Structural steel shall be fabricated in conformance with Section 506. All diaphragms shown on the Plans shall be installed prior to placing any concrete formwork.
- (c) Welding. All welding shall conform to the requirements of Subsection 506.10.
- (d) Reinforcing Steel. Bar reinforcement shall be furnished and installed in conformance with Section 507.
- (e) Concrete. Concrete mix and proportioning shall meet the requirements of Subsection 501.03 for Concrete, High Performance Class A. Concrete shall be produced and tested in accordance with Subsections 501.04 through 501.07.
- (f) Pre-Production Meeting. Unless the Engineer deems, in writing, that a pre-production meeting is unnecessary, then a pre-production meeting shall be held a minimum of seven (7) calendar days prior to beginning concrete placement. The pre-production meeting shall be attended by, and including but not limited to, the Crew Supervisor, Contractor Project Manager, Inspector or Inspector's Supervisor, and Design Project Manager and/or Designer.
- (g) Placing Concrete. Concrete shall not be deposited in the forms until the Agency representative has approved placement of the reinforcement and inserts. The concrete shall be vibrated internally, externally, or a combination thereof to the required

consolidation. The vibrating shall be done with care and in such a manner that:

- (1) Concrete is uniformly consolidated.
 - (2) Displacement of reinforcement and inserts is avoided.
 - (3) Acceptable finish surfaces are produced.
- (h) Curing. Curing shall meet the requirements of Subsection 501.17.
- (i) Removal of Forms. Forms shall not be removed until the curing period has ended.
- (j) Concrete Finishing. Finishing shall conform to the requirements of Subsection 501.16.
- (k) Dimensional Tolerances.
- (1) Geometry of Concrete Deck.
 - a. Length (Each Unit). $\pm 3/4$ " (Adjacent unit lengths shall not vary by more than 20 mm (3/4"))
 - b. Width. $\pm 3/8$ "
 - c. Deck Thickness. $+ 3/8$ ", $- 1/4$ "
 - d. Deviation from Diagonals. $\pm 3/4$ " (horizontal)
 - e. Deviation from End Squareness or Skew. $\pm 3/4$ " (horizontal)
 - f. Stringer Spacing. $\pm 1/2$ " (within a unit)
 - g. Horizontal Alignment. $\pm 3/8$ " (Deviation from straight line parallel to the centerline of the unit)
 - h. Insert Location. $\pm 3/8$ "
 - (2) Reinforcing.
 - a. Spacing. ± 1 " (non-cumulative)
 - b. Cover (Top and Bottom Mat). $\pm 1/4$ "
 - (3) Field Installation.
 - a. Vertical deviation between units prior to grouting shall not exceed $3/8$ ".
 - b. Deviation in joint width between units shall be $\pm 1/2$ ".
- (l) Acceptance of Units. Individual precast units will not be accepted for any of the following reasons:

- (1) Fractures or cracks passing through the deck.
 - (2) Camber that does not meet the requirements in the approved Fabrication Drawings.
 - (3) Honeycombed open texture.
 - (4) Dimensions not within the allowable tolerances as specified.
 - (5) Separation of the concrete deck from the steel girders.
 - (6) Defects that indicate proportioning, mixing, and molding not in compliance with the Specifications.
 - (7) Damaged ends where such damage would prevent making a satisfactory joint.
 - (8) Units with crack(s) within any part of the concrete that is/are greater than 0.8 mm (0.03") in width.
 - (9) Significant damage to the units during transportation, erection, or construction as determined by the Engineer.
 - (10) Units not fabricated in accordance with the Contract Documents.
- (m) Repair of Units. Units that contain minor defects caused by manufacture or handling may be repaired at the manufacturing site. Repair procedures shall be in accordance with the approved Quality Control Plan and require approval by the Engineer. Minor defects are defined as holes, honeycombing, or spalls which are 150 mm (6 inches) or less in diameter and do not penetrate deeper than 25 mm (1 inch) into the concrete. Surface voids or "bugholes" that are less than 16 mm (5/8 inch) in diameter and less than 6 mm (1/4 inch) deep need not be repaired. Repairs shall be made using an overhead and vertical concrete repair material satisfactory to the Engineer. The repair material shall be cured as specified by the manufacturer. The Engineer shall approve final repairs.
- (n) Cracking. Crack widths less than 0.3 mm (0.01") shall be sealed with a penetrating sealer using Agency approved materials and procedures. Crack widths measuring 0.3 mm to 0.8 mm (0.01" to 0.03") shall be epoxy injected using Agency approved materials and procedures. At the Engineer's discretion, cracked members shall be repaired or replaced at the Contractor's expense.
- (o) Labeling. Each unit shall be clearly and permanently labeled on the underside of the deck (in the vicinity of the upstation end diaphragm) with the following information:
- (1) Manufacturer
 - (2) Date of Manufacture

(3) Mark Number

- (p) Production Site Handling. Units shall not be lifted, moved, or otherwise disturbed until the concrete has reached full design strength.
 - (q) Pre-Assembly. The units shall be pre-assembled at the fabrication location to assure proper match between adjacent units before shipping to the project site, to the satisfaction of the Agency.
 - (r) Shipping. Units shall not be shipped until the minimum 28-day strength is attained and they have been stamped by the Agency. A 48-hour advance notice of the loading and shipping schedule shall be provided. The units shall be secured on the vehicle in order that no fatigue cracking will occur during transport. The Contractor shall secure the necessary hauling permits.
- xx. HANDLING. Handling shall be performed in accordance with Subsection 540.09.
- xx. INSTALLATION.
- (a) General. The PBU's shall be fabricated in accordance with the applicable Sections of the specifications and/or the Special Provisions for each respective item. Construction procedures and permissible variations other than those contained herein shall be submitted for approval.
 - (b) Erection Plan. Cranes, lifting devices, and other equipment for erecting PBU superstructure shall be of adequate design and capacity to safely erect, align, and secure all members and components in their final positions without damage. The Contractor is solely responsible for the methods and equipment employed for the erection of the precast concrete/steel composite superstructure units.

The Contractor shall submit Construction Drawings in accordance with Section 105 for the methods and sequence of precast concrete/steel composite superstructure unit erection, the temporary bracing, and the equipment to be used for the erection. The erection plan shall include the necessary computations to indicate the magnitude of stress in the segments during erection and to demonstrate that all of the erection equipment has adequate capacity for the work to be performed. The erection plan shall contain provisions for all stages of construction, including temporary stoppages.

The PBU's may be used to support equipment prior to placement of the pavement only with written permission of the Engineer. The proposed use of the precast concrete/steel composite superstructure units for support of equipment shall be detailed in the erection plan.

Submittal of the erection plan is for the Agency's information only, and shall in no way be construed as approval of the proposed method of erection. Unless otherwise directed by the

Engineer, the Contractor shall follow the erection plan as submitted.

- (c) Erection of Units. Erection of units shall not proceed until substructure concrete has been cured for the minimum length of time specified in the Plans or appropriate Specifications. Units shall be installed to the correct line and grade as shown on the approved drawings and as indicated in the approved erection procedure. Prior to setting units and to avoid torsion stresses, bearing elevations within a given PBU shall be adjusted to match relative elevations used during the deck casting operations. After all the units are erected, they shall be inspected to ensure the correctness of their location.
 - (d) Matching Elevation of Units. Adjacent units shall match elevation within 6 mm (1/4 inch) vertically (along longitudinal edges) and 6 mm (1/4 inch) vertically at the end of units. If the tolerance is not met, the units shall be adjusted as indicated in the procedures shown on the approved Working Drawings.
 - (e) Filling and Sealing Longitudinal Joints. Prior to placement of closure pour concrete or grout material, the surface of the joint shall be free of any material, such as oil, grease, or dirt, which may prevent bonding of the sealing materials.
 - (f) Sealing of Lifting Holes. After the units are in their final locations, a bonding agent shall be applied and the lifting holes filled with cementitious grout. A removable form shall be provided at the bottom surface of the deck to retain the grout.
 - (g) Loading. Units may be loaded upon erection and before the joints are sealed in accordance with the approved erection procedure. Once the joints are sealed, no further loading of the units will be allowed until joint material has properly and finally cured and as approved by the Engineer.
 - (h) Final Repairs. After the installation work is complete, remaining concrete defects, holes for inserts, and lifting holes shall be repaired as indicated and approved by the Engineer.
 - (i) Grout. Grout shall be placed in accordance with the requirements of Subsection 540.11.
- xx. METHOD OF MEASUREMENT. The quantity of Special Provision (Prefabricated Bridge Unit Superstructure) to be measured for payment will be the number of square meters (square yards) installed in the complete and accepted work. Measurement shall be bound by the horizontal projection of bridge fascias and centerline of bearings near the ends of the bridge.
- xx. BASIS OF PAYMENT. The accepted quantity of Special Provision (Prefabricated Bridge Unit Superstructure) will be paid for at the Contract unit price per square meter (square yard). Payment will be full compensation for detailing, fabricating, repairing, quality control testing, transporting, handling, and installing the materials specified, including concrete, reinforcing steel, structural steel,

shear studs, connectors, and shims; for designing and installing lift brackets and any other material contained within or attached to the members; for any grouting work required; for furnishing and implementing the erection plan; and for furnishing all labor, tools, equipment, and incidentals necessary to complete the work.

Bearing assemblies and concrete and reinforcing steel within the longitudinal superstructure closure pours and end diaphragm closure pours will be paid for separately.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
900.675 Special Provision (Prefabricated Bridge Unit Superstructure)	Square Meter (Square Yard)