

ITEM 01557.55 M - FIBER REINFORCED POLYMER COMPOSITE BRIDGE DECK (FIXED PRICE)

DESCRIPTION

This work shall consist of furnishing the fiber reinforced polymer (FRP) deck panels and connections to the steel stringers, as shown on the plans and in accordance with these specifications. The FRP deck system shall be furnished by Martin Marietta Composites, Inc. of Raleigh, NC. The contact person is Greg Solomon (919) 788-4367.

MATERIALS

The manufacture shall submit certified test data for all materials reflecting conformance to the requirements specified herein. The isophthalic polyester resin for the pultruded tubes shall be Aropol 7334T-15 as manufactured by Ashland Chemicals or approved equal. The mechanical properties of the resin shall meet the following requirements:

PROPERTY	VALUE	TEST METHOD
Tensile Strength	75.8 MPa	ASTM D638M
Tensile Modulus	3,380 MPa	ASTM D638M
Tensile Elongation	3.3 %	ASTM D638M
Thermal Expansion	-5 5.85 x10 / °C	ASTM D696

The E-glass fiber reinforcement for the pultruded tubes shall be Hybon 2022 as manufactured by Johnston Industries Inc. or approved equal. The mechanical properties of the reinforcement shall meet the following requirements:

PROPERTY	VALUE	TEST METHOD
Tensile Strength	3,450 MPa	ASTM D2343
Tensile Modulus	72,400 MPa	ASTM D2343
Thermal Expansion	-6 5.04 x 10 / °C	---

The mechanical properties of the face sheets and web wall laminates shall meet the following requirements:

PROPERTY	FACE SHEET VALUE	WEB WALL VALUE	TEST METHOD
Tensile Strength, LW	261 MPa	221 MPa	ASTM D638M
Tensile Strength, CW	147 MPa	130 MPa	ASTM D638M
Tensile Modulus, LW	21 200 MPa	17 400 MPa	ASTM D638M
Tensile Modulus, CW	11 800 MPa	9 650 MPa	ASTM D638M
Fiber Content (weight)	60 %	60%	ASTM D2584
Void Content	æ2%	æ2%	ASTM D2734

LW= lengthwise, CW= crosswise

The end closure shall be a FRP composite material with quad fabric and a minimum fiber volume of 45%. The resin reinforcement shall be the same as specified for the deck tubes.

The adhesive used to shop bond the FRP tubes together shall be Pliogrip 7779 as manufactured by Ashland Chemical or approved equal. The adhesive shall be suitable for structural bonding of FRP laminates with the bond gap thickness proposed and achieved. The adhesive shall have a minimum single lap shear strength of 7 MPa when tested in accordance with ASTM D5868.

A U-V inhibited, NPG-ISO polyester gel coat shall be applied to the exposed edges and bottom of the deck. The gel coat shall be Federal Color Standard No. 37722 (Buff) .

The finished dimensions of the deck shall meet ASTM D3917-96 "Standard Specification for Dimensional Tolerances of Thermosetting Glass-Reinforced Plastic Pultruded Shapes". The finished dimensions of the tubes, deck panels, and sleeves shall also meet the supplemental tolerances listed below.

Web and face skin thickness: ± 1.0 mm
Overall depth of tube: ± 1.5 mm

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Tube out-of-straightness:	± 8.0 mm in 14 meters
Panel length and width:	± 6.0 mm
Bond line thickness:	1.524 mm ± 0.762 mm
Gel coat thickness:	+ 50 µm

BASIS OF ACCEPTANCE

1. Shop drawings shall be submitted to the Engineer and shall include the following information as a minimum:
 - Cross- sectional and overall dimensions
 - Material references
 - Tolerances
 - Fabrication details
 - Required gaps and clearances
 - Integration of components
 - Lifting devices
2. Certified test results.
3. All product data, installation, and maintenance instructions for all fiberglass, resin, adhesive, and gel coat used to manufacture the deck panels shall be submitted to the Engineer for review and acceptance.
4. All manufacturer instructions and recommendations for panel delivery, storage and installation shall be submitted to the Engineer for review and acceptance.
5. The manufacturer shall provide design calculations and load rating calculations for the deck. The deck shall be designed for an MS 18 live load. A future additional 50 mm layer of asphalt shall be assumed in the design. Live load deflections shall be limited to $L/640$ where L is the distance between steel support members. The connections between the steel stringers and the deck shall be designed for full composite action. The connections between the deck and stringers shall be capable of experiencing 500,000 MS 18 truck loading cycles prior to the initiation of fatigue cracks. The design and the load rating shall be certified by a licenced professional engineer.
6. The manufacture of the FRP panels shall provide a technical representative to assist in the field erection of the FRP panels. The technical representative shall be experienced in the material and performance characteristics of the FRP and adhesive materials, as well as handling requirements. The technical representative shall act in an advisory capacity and will report to the Contractor and the Engineer any operations or procedures which are considered by the representative as being detrimental to the integrity of the deck system. The manufacturer's technical representative will be present during erection, bonding and placing of the FRP splice strips. The manufacturer shall also provide qualified personnel to perform the field splice bonding of the panels and installation of the FRP composite splice strips. Personnel other than those appointed by the manufacture will not be allowed to perform such work.

CONSTRUCTION DETAILS

Transportation and site handling shall be performed with acceptable equipment and methods, and by qualified personnel and in accordance with the manufacturer's recommendations. The manufacturer will be responsible for delivery of the deck panels to the bridge site.

The panels shall be lifted and supported during transportation, stockpiling and erection operations only at lifting or supporting points as shown on the shop drawings, and with approved lifting devices. The panels shall be kept flat and true to prevent warping or twisting of the panels during lifting, transporting and storing. The panels shall not be turned or placed on their sides or with the top surface down. Lifting of the panels from one edge will not be permitted. All panels shall be stored off the ground and protected with covers that are impervious to sunlight in order to provide protection from ultraviolet light. Stacked panels shall be supported on unyielding supports and shall be separated by battens across the full width of each bearing/lifting point. The panels shall be stacked such that the lifting devices are accessible and undamaged. Panels damaged by improper handling, storing, transportation or lifting shall be repaired or replaced at the discretion of the Engineer at no expense to the Department.

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METHOD OF MEASUREMENT

Payment will be made at the lump sum price bid for this work.

BASIS OF PAYMENT

The amount set forth in the Proposal is a fixed price for all bidders and shall not be changed. The published price has been prepared taking into account the cost of furnishing all labor and equipment necessary to complete the work, and including an allowance for overhead and profit. Any bid other than the amount noted in the Proposal may cause the bid to be considered informal.

Payment will be made after the installation of the deck.