

ENGINEERING SPECIFICATION

ReadySpan Prefabricated FRP Pedestrian Bridge

ReadySpan FRP Prefabricated Bridge Specifications

PART 1 - GENERAL

1.1 SCOPE

These specifications shall apply to Fiber Reinforced Polymer (FRP) composite bridges designed to carry pedestrian, bicycle, and/or equestrian traffic. The FRP structure shall be a ReadySpan bridge manufactured by Bedford Reinforced Plastics, 1 Corporate Drive, Bedford, PA 15522 or approved equal.

1.2 QUALIFIED SUPPLIERS

- A. Manufacturer shall be responsible for the design, engineering, fabrication, and shipment of the FRP structural bridge components and systems. All FRP materials used in the bridge construction must be pultruded by the bridge manufacturer.

1.3 SUBMITTALS

- A. Manufacturer shall provide “**Approval Bridge Drawings**” and “**Structural Design Calculations**” in accordance with the load conditions in this specification. These deliverables shall be sealed and signed by a registered Professional Engineer. The manufacturer shall provide these submittals prior to the fabrication of the bridge for the customer review and approval. Reference Section 2.2 Engineering for the load ratings for this bridge.
- B. Manufacturer shall provide “Assembly and Installation Instructions” of the bridge components including, but not limited to, location, lengths, type and sizes of fasteners, clip angles, member sizes, and connection details. These instructions shall provide the customer with a step-by-step process for assembling and installing the complete bridge.

1.4 QUALITY ASSURANCE

- A. All items to be provided under this Specification shall be furnished only by manufacturers having a minimum of ten (10) years of experience in the design and manufacture of similar products and systems. Additionally, if requested, a record of at least five (5) previous, separate, similar successful installations in the last five (5) years shall be provided.
- B. Manufacturer shall offer a twenty-five (25) year limited warranty on all FRP products against defects in materials and workmanship. The manufacturer shall provide a copy of the warranty to the customer.

1.5 PRODUCT DELIVERY

- A. Manufactured bridge parts shall be delivered by truck on pallets and packages to a location nearest the site accessible by roads. Bridges can be delivered unassembled, partially assembled, or fully-assembled as specified by the Owner.
- B. The Owner shall be responsible for the unloading of the materials from the delivery truck; and the transportation of the parts to the bridge site or staging area. The manufacturer shall notify the Owner 24 hours in advance of the expected delivery.
- C. The Owner shall procure all information about the site and soil conditions including soil tests. The engineering design and construction of the bridge abutments, piers, and/or footings shall be the responsibility of the Owner. The bridge manufacturer Submittals shall provide the support reaction loads, anchor bolt locations, and critical dimensions and data pertaining to the installation of the bridge on the foundations.

PART 2 – GENERAL FEATURES OF DESIGN

2.1 DESIGN

- A. **Span:** Bridge shall be XX feet long and shall be measured from each end of the bridge structure. The end design shall be straight-end or sloped-end (select end type).
- B. **Width:** Bridge width shall be XX feet and shall be measured from the inside flanges of the Top Caps located on the top of the hand-railing top chord channels.
- C. **Bridge System Type:** Bridge shall be designed with Fiber Reinforced Polymer (FRP) composite profiles and structural shapes as required. All structural members shall be fabricated from pultruded FRP composite profiles.
- D. **Camber:** Bridge shall be designed to be pre-cambered to eliminate the initial dead load deflection. The pre-camber amount shall be determined by the structural analysis.
- E. **Hand-Railing Height:** Bridge shall be designed with a truss hand-railing structure to a minimum height of 54 inches in accordance with the OSHA standard 1910.29 load rating.
- F. **Hardware/Fasteners:** Bridge shall be supplied with either A307 hot-dipped galvanized steel or 316 stainless steel hardware. This hardware shall include bolts, nuts, spring washers, and flat washers and screws as required. (Select material type).
- G. **Color:** Bridge shall be supplied with an Olive Green or Brown color (Select color).
- H. **Decking:** Manufacturer can supply the following types of decking (Select one):
 - a. 3x12, pressure-treated Southern Yellow Pine decking with board spacing no more than 0.50" and no less than 0.25" in accordance with ADA requirements.
 - b. 1-1/2" thick FRP molded ISO polyester grating with anti-skid grit coated decking.
 - c. 5/4" thick x 8" wide (nominal) WearDeck fiberglass reinforced decking
 - d. 24" wide FiberFit HD (heavy-duty) FRP pultruded decking with anti-skid grit coating.
- I. **Safety Mid-Rails:** Bridge shall include 4" c-channel continuous safety mid-rails installed horizontally along the length of the bridge to the inside of the trussed hand-railings. The mid-rails shall be spaced at a maximum separation distance of 4 inches in accordance with ADA requirements.
- J. **Top Caps:** Bridge shall include c-channel Top Caps installed permanently to the top of the hand-railing trusses along the total length of the bridge. Top Caps shall be painted to provide additional protection from UV radiation.
- K. **Mounting Devices:** Manufacturer shall provide 316 stainless steel mounting angle clips used to anchor the bridge ends to the foundation anchor bolts. Foundation anchor bolts shall be the responsibility of the customer/contractor.

2.2 ENGINEERING

The structural design of the bridge shall be done under the direct supervision of a Licensed Professional Civil Engineer and done in accordance with recognized engineering practices and principles. The manufacturer shall use design standards established by **ASCE 7-10, Minimum Design Loads for Buildings and Other Structures**. The manufacturer shall utilize a RISA 3-D analysis program (or approved equal) in order to provide the design and engineering structural calculations based on the bridge size and load specified load conditions.

- A. **Uniform Live Load:** The manufacturer shall use 85 PSF for pedestrian bridges with lengths of 10' long to 90' long. This live load applies to bridges in the range of 3'-0" wide to 6'-0" wide. For bridges in the range of 7'-0" wide to 10'-0" wide, the live loads can vary from 60 PSF to 85 PSF based on the size of the bridge.
- B. **Vehicle Live Load:** The VLL applies only to bridges with a width from 7'-0" to 10'-0". The manufacturer shall provide the structural analysis to support a vehicle live load equal to the H-5 requirement of 10,000 lbs. The analysis shall support 8 kips on the rear axle and 2 kips on the front axle.
- C. **Snow Load:** The manufacturer shall provide structural analysis to support the PSF snow load based on the geographic location of the bridge installation.
- D. **Wind Load:** The manufacturer shall provide structural analysis to support the PSF wind load based on the geographic location of the bridge installation.
- E. **Seismic Load:** The manufacturer shall provide structural analysis dependent on the regional seismic load conditions per the ASCE 7-10 standard referenced above.

2.3 SERVICEABILITY CRITERIA

- A. **Deflection:** Manufacturer shall design the bridge to a maximum of L/240 for deflection.
- B. **Vertical Fundamental Frequency:** Manufacturer shall design the bridge for a vertical fundamental frequency to be greater than or equal to 5.0 Hz.
- C. **Horizontal Fundamental Frequency:** Manufacturer shall design the bridge for a horizontal fundamental frequency to be greater than or equal to 3.0 Hz.

2.4 MANUFACTURER

Structural bridge parts shall be PROForms[®] as manufactured by

Bedford Reinforced Plastics, Inc.

One Corporate Drive
Bedford, PA 15522. USA
(814) 289-1234 Sales Account Manager
Email: ted.harris@bedfordreinforced.com
Website: <https://bedfordreinforced.com>

2.5 MATERIALS

- A. Manufacturer shall pultrude structural shapes with a glass content minimum of 45%, maximum of 55% by weight. The structural shapes shall be composed of fiberglass reinforcement and resin in qualities, quantities, properties, arrangements and dimensions as necessary to meet the structural design analysis requirements.
- B. Fiberglass reinforcement shall be a combination of continuous roving, continuous strand mat, and surfacing veil in sufficient quantities as needed by the application and/or physical properties required.
- C. Resins shall be ISO, non-fire retardant isophthalic PolyEster (PE) used to produce NSF Standard 61 certified shapes with chemical formulation necessary to provide the corrosion resistance, strength and other physical properties as required.
- D. All finished surfaces of FRP items and fabrications shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well covered with resin to protect against their exposure due to wear or weathering.

E. Pultruded structurals shall be further protected from ultraviolet (UV) attack with integral UV inhibitors in the resin and a minimum 7 mil thick synthetic surfacing veil to produce a resin rich surface.

F. Pultruded structurals shall have minimum longitudinal mechanical properties listed below:

Property	ASTM Method	Value	Units
Tensile Strength	D-638	30,000 (206)	psi (MPa)
Tensile Modulus	D-638	2.5×10^6 (17.2)	psi (GPa)
Flexural Strength	D-790	30,000 (206)	psi (MPa)
Flexural Modulus	D-790	1.8×10^6 (12.4)	psi (GPa)
Flexural Modulus (Full Section)	N/A	2.8×10^6 (19.3)	psi (GPa)
Short Beam Shear (Transverse)	D-2344	4,500 (31)	psi (MPa)
Shear Modulus (Transverse)	N/A	4.5×10^5 (3.1)	psi (GPa)
Coefficient of Thermal Expansion	D-696	7.0×10^{-6} (12.6×10^{-6})	in/in/°F (cm/cm/°C)
Flame Spread	E-84	25 or less	N/A

PART 3 – FABRICATION

3.0 TOLERANCES

- A. All pultruded parts shall be in conformance with the latest ASTM D4385 for “**Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products**” and the latest ASTM D 3917 for “**Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastic Pultruded Shapes.**” No material deviations beyond industry standards are accepted.
- B. Manufacturer shall fabricate and mark all components for field assembly with appropriate part numbers that cross-reference the Assembly & Installation Instructions. No parts shall require any field cutting, drilling, or other field modification unless specified.
- C. The structural shapes shall be free, as commercially possible, from visual defects such as foreign inclusions, delaminations, blisters, resin burns , air bubbles, and pits.

END OF SPECIFICATION