

PRE-FABRICATED BRIDGE SPECIFICATIONS

1.0 GENERAL

These specifications are for a fully engineered clear span bridge of Fiber Reinforced Polymer (FRP) composite construction and shall be regarded as minimum standards for design and construction as manufactured.

2.0 GENERAL FEATURES OF DESIGN

2.1 SPAN

Bridge span will be 40'-0" (straight line dimension) and shall be measured from each end of the bridge structure.

2.2 WIDTH

Bridge width shall be 4'0" and shall be measured from the inside face of structural elements at deck level.

2.3 BRIDGE SYSTEM TYPE

Bridge must be designed as a FRP Composite Truss Span

2.4 MEMBER COMPONENTS

All members shall be fabricated from pultruded FRP composite profiles and structural shapes as required

2.5 CAMBER

Bridge can be precambered to eliminate initial dead load deflections. Camber of 1% of the total span length can be provided on request

3.0 ENGINEERING

Structural design of the bridge structure shall be performed by or under the direct supervision of a Licensed Professional Engineer, licensed in the State of Pennsylvania and done in accordance with recognized engineering practices and principles

3.1 UNIFORM LIVE LOAD

Bridge shall be designed for 84 psf.

3.2 VEHICLE LOAD

Bridge shall be designed for 85 psf.

3.3 WIND LOAD

The bridge shall be designed for a minimum wind load of 23 psf. The wind is calculated on the entire vertical structure of the bridge as if fully enclosed

3.4 SEISMIC LOAD

Seismic loads shall be determined according to the criteria specified in the standard building codes (IBC 2002, /ASCE 7-02, BOCA, SBC or UBC) unless otherwise requested. Response Spectrum Analysis shall be performed in those designs that require complex seismic investigation. All necessary response spectra information will be provided by the client for evaluation

3.5 ALLOWABLE STRESS DESIGN APPROACH

An allowable Stress Design (ASD) approach is to be used for the design of structural members, Bidders should comply with the design of FRP bridges are as follows unless otherwise specified: (Based on the Ultimate Strength of the FRP material)

Tension	2.5
Compression	2.5
Shear	2.5
Bending	2.5
End Bending	2.5
Connections	3.0

3.6 SERVICEABILITY CRITERIA

Service loads are used for the design of all structural members when addressing deflection and vibration issues. Criteria used by Bidder in the design of FRP bridges should be as follows:

Deflection:

$$\text{Live Load (LL) deflection} = L/240$$

$$\text{Vertical Frequency (fn):} = 5.0\text{Hz}$$

The fundamental frequency of the pedestrian bridge (in the vertical direction) without live load should be greater than 5.0 hertz (Hz) to avoid any issues with the first and second harmonics.

$$\text{Horizontal Frequency (fn):} = 3.0 \text{ Hz}$$

The fundamental frequency of the pedestrian bridge (in the horizontal position without live load) should be greater than 3.0 hertz (Hz) to avoid any issues due to side to side motion involving the first and second harmonics

3.7 SNOW LOAD

Sustained snow load conditions shall be evaluated for time dependent effects (creep and relaxation) and expected recovery behavior

4.0 MATERIALS

4.1 FRP COMPOSITES

FRP bridge shall be fabricated from high-strength E-glass and isophthalic polyester resin unless otherwise specified

Weathering and ultraviolet light protection shall be provided by addition of a veil to the laminate construction. Minimum materials strengths and properties are as follows:

Tension	33,000 psi
Compression	33,000 psi
Shear	4,500 psi
Bending	33,000 psi
Young's Modulus	2,800,000 psi

The minimum thickness of FRP Composite shapes shall be as follow unless otherwise specified: Square tube members (closed type shape) shall be 0.25 in. Wide-flange beams, channel sections, and angles (open type shapes) shall be a minimum thickness of 0.25 in. Standard plate shall be a minimum thickness of 0.25 in.

4.2 DECKING

Wood decking in No. 2 or better Southern Yellow Pine treated according to the American Wood Preservers Bureau. The standard three inches (3") thick x twelve inches (12") wide planks are provided for pedestrian loading conditions

4.3 HARDWARE

Bolted connections shall be A307 hot-dipped galvanized steel unless otherwise specified. Mounting devices shall be galvanized or stainless steel.

5.0 SUBMITTALS

5.1 SUBMITTAL DRAWINGS

Schematic drawings and diagrams shall be submitted to DCNR for review after receipt of order. As required, all drawings shall be signed and sealed by a Pennsylvania Licensed Professional Engineer.

5.2 SUBMITTAL CALCULATIONS

As required, structural calculations shall be submitted to the DCNR. All calculations will be signed and sealed by a Pennsylvania Licensed Professional Engineer

6.0 FABRICATION

6.1 TOLERANCES

All cutting and drilling fabrication to be done by experienced fiberglass workers using carbide or diamond-tipped tooling to a tolerance of 1/16". No material deviations beyond industry standards are accepted. All cut edges to be cleaned and sealed.

7.0 RAILINGS

Railings for bridges will be a minimum of forty-two inches (42") above the floor deck.

7.1 SAFETY RAILS

Continuous horizontal midrails shall be located on the inside of the bridge trusses. Maximum opening between the midrails shall be available as required, but should not be greater than nine inches (9")

7.2 TOEPLATES

Toeplates are three inches (3") green channels

8.0 FINISHING

Bridge color shall be Natural Earth Tones (brown, green, gray, etc.). No painting is required as the color is added during the manufacturing process.

9.0 DELIVERY

9.1 Delivery is made by truck to:
DCNR Bureau of Forestry
258 Sizerville Road
Emporium., PA 15834

Bidder will notify DCNR in advance of the expected time of arrival at the site. Bridge will be shipped to the site in components parts or partially assembled. The spans can be completely assembled using standard hand tools.

9.2 ERECTION DIRECTION

For bridge shipped in components parts or partially assembled, Bidder shall provide assembly drawings and a recommended assembly procedure for building the bridge. Temporary supports or rigging equipment, if needed, is the responsibility of the DCNR.

9.3 SITE ISSUES and FOUNDATION DESIGN

DCNR shall procure all necessary information about the site and soil conditions. The construction of the bridge abutments, and/or footings shall be by DCNR.