

PRE-FABRICATED BRIDGE and BOARDWALK SPECIFICATIONS

1.0 GENERAL

1.1 SCOPE

These specifications are for a fully engineered clear span bridge and boardwalk 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 35'-0" (straight line dimension) and shall be measured from each end of the bridge structure.

2.2 WIDTH

Bridge width shall be 6'-0" and shall be measured from the inside face of structural elements at deck level.

2.3 BRIDGE SYSTEM TYPE

Bridges 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

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

3.0 ENGINEERING

Structural design of the bridges 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

Bridges shall be designed for 85 psf.

3.2 VEHICLE LOAD

Bridge shall be designed for 85 psf.

3.3 WIND LOAD

The bridges and boardwalk shall be designed for a minimum wind load of 25 psf. The wind is calculated on the entire vertical structure of the bridges and boardwalk 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, Bidder 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:		
Live Load (LL) deflection	=	L/240
Vertical Frequency (fn):	=	5.0 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.

Horizontal Frequency (fn):	=	3.0 Hz
----------------------------	---	--------

The fundamental frequency of the pedestrian bridge (in the horizontal direction) 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 bridges 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 material 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 follows 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 horses, pedestrian, and bicycle type 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 fifty-four inches (54") above the floor deck.

7.1 SAFETY RAILS

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

7.2 TOE PLATES

Toe plates are three inch (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

Delivery is made by truck to:

Ansonia Maintenance Headquarters
2905 Colton Road
Wellsboro PA, 16901

Bidder will notify Forest District Office at 570-724-286 48-hours in advance of the expected time of arrival to the site. Bridge will be shipped to the site in component parts or partially assembled. The spans can be completely assembled using standard hand tools.

9.1 ERECTION DIRECTION

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

9.2 SITE ISSUES and FOUNDATION DESIGN

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

10.0 WARRANTY

Bidder shall warrant the structural integrity of all FRP materials, design, and workmanship for 15 years.

This warranty shall not cover defects in the bridges or boardwalk caused by foundation failures, abuse, misuse, overloading, accident, faulty construction or alteration, or other cause not the result of defective materials or workmanship.

This warranty shall be limited to the repair or replacement of structural defects, and shall not include liability for consequential or incidental damages.