Appendix B—Proposed Guide Specifications for the Design of FRP Pedestrian Bridges

The following specification was a proposed AASHTO FRP Pedestrian Bridge Specification written by E.T. Techtonics, Inc. The guideline, which differs from this draft, was published as "Guide Specifications for Design of FRP Pedestrian Bridges: First Edition, 2008" by the American Association of State Highway and Transportation Officials, http://www.transportation.org.

GUIDE SPECIFICATIONS FOR DESIGN OF FRP PEDESTRIAN BRIDGES

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Guide Specifications For Design of FRP Pedestrian Bridges

1.1 GENERAL

These Guide Specifications shall apply to FRP composite bridges intended to carry primarily pedestrian and/or bicycle traffic. Unless amended herein, the existing provisions of the AASHTO Standard Specifications for Highway Bridges, 16th Edition, shall apply when using these Guide Specifications. The AASHTO LRFD Bridge Design Specifications in conjunction with the Design and Construction Specifications for FRP Bridge Decks (Constructed Facilities Center at West Virginia University) and A Model Specification for Composites for Civil Engineering Structures (Lawrence C. Bank at the University of Wisconsin) should be used. In lieu of this approach, a Service Design Load Approach can be used for particular applications.

1.2 DESIGN LOADS

1.2.1 Live Loads

1.2.1.1 Pedestrian Live Load

Main Members: Main supporting members, including girders, trusses, and arches, shall be designed for a pedestrian live load of 85 lb/sq ft (4.07 KPa) of bridge walkway area. The pedestrian live load shall be applied to those areas of the walkway so as to produce maximum stress in the member being designed.

If the bridge walkway area to which the pedestrian live load is applied (deck influence area) exceeds 400 sq ft (37.16 m²), the pedestrian live load may be reduced by the following equation:

\[
 w = 85 \left( 0.25 + \frac{15}{\sqrt{A_1}} \right)
\]

where:
- \( w \) = design pedestrian load (psf)
- \( A_1 \) = deck influence area (sq ft)

In no case shall the pedestrian live load be less than 65 psf (3.11 KPa).

Secondary Members: Bridge decks and supporting floor systems, including secondary stringers, floor beams, and their connections to main supporting members, shall be designed for a live load of 85 psf (4.07 KPa), with no reduction allowed.

1.2.1.2 Vehicle Load

Pedestrian/bicycle bridges should be designed for an occasional single maintenance vehicle load provided vehicular access is not physically prevented. A specified vehicle configuration determined by the operating agency may be used for this design vehicle.

If an Agency design vehicle is not specified, the following loads conforming to the AASHTO Standard H-Truck shall be used. In all cases, a single truck positioned to produce the maximum load effect shall be used:
Appendix B—Proposed Guide Specifications for the Design of FRP Pedestrian Bridges

Clear deck width from 6 to 10 ft: 10,000 lb (44.48 kN)  
(H-5 Truck)  
Clear deck width over 10 ft: 20,000 lb (88.96 kN)  
(H-10 Truck)  

The maintenance vehicle live load shall not be placed in combination with the pedestrian live load.

A vehicle impact allowance is not required.

1.2.2 Wind Loads  
A wind load of the following intensity shall be applied horizontally at right angles to the longitudinal axis of the structure. The wind load shall be applied to the projected vertical area of all superstructure elements, including exposed truss members on the leeward truss.  
For trusses and arches: 75 psf (3.59 KPa)  
For girders and beams: 50 psf (2.39 KPa)  

For open truss bridges, where wind can readily pass through the trusses, bridges may be designed for a minimum horizontal load of 35 psf (1.68 KPa) on the full vertical projected area of the bridge, as if enclosed.  

A wind overturning force shall be applied according to Article 3.15.3 of the Standard Specifications for Highway Bridges.

1.2.3 Combination of Loads  
The load combinations, i.e., allowable stress percentages for service load design and load factors for load factor design as specified in table 3.22.1A of the Standard Specifications for Highway Bridges, shall be used with the following modifications:  
Wind on live load, WL, shall equal zero  
Longitudinal force, LF, shall equal zero

1.3 DESIGN DETAILS

1.3.1 Deflection  
Members should be designed so that the deflection due to the service pedestrian live load does not exceed \( \frac{1}{400} \) of the length of the span.

The deflection of cantilever arms due to the service pedestrian live load should be limited to \( \frac{1}{200} \) of the cantilever arm.

The horizontal deflection due to lateral wind load shall not exceed \( \frac{1}{400} \) of the length of the span.
1.3.2 Vibrations
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 associated with the first and second harmonics. If the second harmonic is a concern, a dynamic computer analysis should be performed.

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.

The fundamental frequencies of the pedestrian bridge in the vertical and horizontal directions should be different to avoid potential adverse effects associated with the combined effects from the first and second harmonics in these directions.

1.3.3 Allowable Fatigue Stress
Standard fatigue provisions do not apply to FRP composite pedestrian bridge live load stresses as heavy pedestrian loads are infrequent and FRP composite pedestrian bridge design is generally governed by deflection criteria. Wind load concerns are also governed by deflection criteria.

1.3.4 Minimum Thickness of FRP
Minimum thickness of closed structural tubular members shall be 0.25 inch (6.4 mm)

Minimum thickness of open structural FRP members shall be 0.375 inch (9.6 mm)

Plate connections also require a minimum thickness of 0.375 inch (9.6 mm)

1.3.5 Connections
Under this specification, bolted connections shall be used for all main and secondary members. Use only galvanized or stainless steel bolts based on approval by the owner. Adhesive bonding can be used in conjunction with bolted connections for all main members and secondary members. Non-structural members can be either bolted/screwed or adhesively bonded.

1.3.6 Half-Through Truss Spans
1.3.6.1 The vertical truss members of the floor beams and their connections in half-through truss spans shall be proportioned to resist a lateral force applied at the top of the truss verticals that is not less than 0.01/K times the average design compressive force in the two adjacent top chord members where K is the design effective length factor for the individual top chord members supported between the truss verticals. In no case shall the value for 0.01/K be less than 0.003 when determining the minimum lateral force, regardless of the K-value used to determine the compressive capacity of the top chord. This lateral force shall be applied concurrently with these members’ primary forces. End posts shall be designed as a simple cantilever to carry its applied axial load combined with a lateral load of 1.0% of the axial load, applied at the upper end.
1.3.6.2 The top chord shall be considered as a column with elastic lateral supports at the panel points. The critical buckling force of the column so determined shall be based on using not less than 2.0 times the maximum design group loading in any panel in the top chord. Maximum design group loading is based on the design loads (not sustained) specified in Section 1.2—Design Loads in this Specification.

1.3.6.3 For sustained snow loads (duration of load a minimum of 3 days) greater than 65 psf (3.11 KPa), the critical buckling force of the column so determined shall be based on using not less than 3.0 times the maximum design group loading in any panel in the top chord. This increased factor will account for any adverse viscoelastic behavior (creep buckling) that potentially could occur in the bridge system.

Commentary

1.1 GENERAL

This guide specification is intended to apply to pedestrian and pedestrian/bicycle bridges that are part of a highway facilities, and provide standards that ensure structural safety and durability comparable to highway bridges designed in conformance with the AASHTO Standard Specifications for Highway Bridges. This specification applies to all bridge types, but specifically to fiber reinforced polymer (FRP) composite construction materials.

The term primarily pedestrian and/or bicycle traffic implies that the bridge does not carry a public highway or vehicular roadway. A bridge designed by these specifications could allow the passage of an occasional maintenance or service vehicle.

This specification allows the use of the methodologies provided by AASHTO LRFD Bridge Design Specifications in conjunction with the Design and Construction Specifications for FRP Bridge Decks (Constructed Facilities Center at West Virginia University) and A Model Specification for Composites for Civil Engineering Structures (Lawrence C. Bank at the University of Wisconsin). In lieu of this approach, a Service Load Design Approach can be used for particular applications where vehicle loading conditions are restricted to an H-5 truck. Manufacturer’s recommended ultimate stresses with factors of safety not less than 3 and modulus of elasticity will provide conservative results. For a discussion of the Service Load Design Approach for FRP Composite Pedestrian Bridges, see Design of Falls Creek Trail Bridge: A Fiber Reinforced Polymer Composite Bridge by Scott Wallace of the Eastern Federal Lands Highway Division of FHWA in conjunction with E.T. Techtonics, Inc., and the USDA Forest Service, Transportation Record No. 1652, Vol. 1, Transportation Research Board, National Academy Press, Washington, DC, 1999.

1.2 DESIGN LOADS

1.2.1 Live Loads

1.2.1.1 Pedestrian Live Load
The 85 psf (4.07 KPa) pedestrian load, which represents an average person occupying 2 square feet (0.186 m²) of bridge deck area, is considered a reasonably conservative service live load that is difficult to exceed with pedestrian traffic. When applied with the AASHTO LRFD Bridge Design Specifications, or a Service Load Design Approach, an ample overload capacity is provided.

Reduction of live loads for deck influence areas exceeding 400 square feet (37.16 m²) is consistent with the provisions of ASCE 7-89, Minimum Design Loads for Buildings and Other Structures, and is intended to account for the reduced probability of large influence areas being simultaneous maximum loaded.

For typical bridges, a single design live load value may be computed based on the full deck influence area and applied to all the main member subcomponents.

The 65 psf (3.11 KPa) minimum load limit is used to provide a measure of strength consistency with the LRFD Specifications.

Requiring an 85 psf (4.07 KPa) live load for decks and secondary members recognizes the higher probability of attaining maximum loads on small influence areas. Designing decks for a small concentrated load (for example 1 kip) (4.48 kN) is also recommended to account for possible equestrian use or snowmobiles.

1.2.1.2 Vehicle Load
The proposed AASHTO vehicle loads are intended as default values in cases where the Operating Agency does not specify a design vehicle. H-Truck configurations are used for design simplicity and to conservatively represent the specified weights.

1.2.2 Wind Loads
The AASHTO wind pressure on the superstructure elements is specified, except that the AASHTO minimum wind load per foot of superstructure is omitted. The 35 psf (1.68 KPa) value applied to the vertical projected area of an open truss bridge is offered for design simplicity, in lieu of computing forces on the individual truss members. The specified wind pressures are for a base wind velocity of 100 miles per hour and may be modified based on a maximum probable site-specific wind velocity in accordance with AASHTO Article 3.15.

1.2.3 Combination of Loads
The AASHTO wind on live load force combination seems unrealistic to apply to pedestrian loads and is also excessive to apply to the occasional maintenance vehicle, which is typically smaller than a design highway vehicle. The longitudinal braking force for pedestrians is also neglected as being unrealistic.
The AASHTO Group Loadings are retained to be consistent with applying the AASHTO LRFD Bridge Design Specifications in conjunction with the Design and Construction Specifications for FRP Bridge Decks (Constructed Facilities at West Virginia University) and A Model Specification for Composites for Civil Engineering Structures (Lawrence C. Bank at the University of Wisconsin) and the Service Load Design Approach without modification.

1.3 DESIGN DETAILS

1.3.1 Deflection
The specified deflection values are more liberal than the AASHTO highway bridge values, recognizing that, unlike highway vehicle loads, the actual live load needed to approach or achieve the maximum deflection will be infrequent. Pedestrian loads are also applied much more gradually than vehicular loads. The AASHTO value of span/1000 is intended for deflections caused by highway traffic on bridges that also carry pedestrians. In the AASHTO Guide Specifications for Design of Pedestrian Bridges (steel, concrete, wood, and aluminum), deflection due to the service pedestrian live load does not exceed $\frac{1}{500}$ of the length of the span. Deflection of cantilever arms due to the service pedestrian live load is limited to $\frac{1}{500}$ of the cantilever arm. The horizontal deflection due to lateral wind shall not exceed $\frac{1}{500}$ of the length of the span. For FRP composite bridges, the specified deflection values are more liberal due to the high strength, but low stiffness (modulus of elasticity) characteristics of the material. Because of the low modulus, FRP composite bridges tend to be at very low levels of stress (in comparison to other materials) at the above deflection limits. Allowing the deflection due to the service pedestrian live load to not exceed $\frac{1}{400}$ of the length of the span, deflection of cantilever arms due to the service pedestrian live load limit to $\frac{1}{200}$ of the cantilever arm, and the horizontal deflection due to lateral wind load to not exceed $\frac{1}{400}$ of the length of the span, FRP composite bridges are at more reasonable levels of stress in conjunction with the serviceability criteria. This allows better use of the material while maintaining a high factor of safety.

1.3.2 Vibrations
Pedestrian bridges have on occasion exhibited unacceptable performance due to vibration caused by people walking or running on them. The potential for significant response due to dynamic action of walking or running has been recognized by several analyses of problem bridges and is provided for in other design codes such as the Ontario Bridge Code. Research into this phenomenon has resulted in the conclusion that, in addition to stiffness, damping and mass are key considerations in the dynamic response of a pedestrian bridge to ensure acceptable design. The range of the first through the third harmonic of people walking/running across pedestrian bridges is 2 to 8 Hertz (Hz) with the fundamental frequency being from 1.6 to 2.4 Hz. Therefore, bridges with fundamental frequencies below 3 Hz (in the vertical direction) should be avoided.

For pedestrian bridges with low stiffness, damping and mass, such as bridges with shallow depth, lightweight (such as FRP), etc., and in areas where running and jumping are expected to occur on the bridges, the design should be tuned to have a minimum fundamental frequency of 5 Hz (in the vertical direction) to avoid the second harmonic. If the structural frequencies cannot be economically shifted, stiffening handrails, vibrations absorbers, or dampers could be used effectively to reduce vibration problems.
In recent years, there have been several pedestrian bridge cases (a classic example is the Millennium Bridge in London), which have exhibited extreme vibration issues in the horizontal direction due to walking and/or running. This problem has been attributed to the high aspect ratio (length/width) of the bridges, which results in relatively low stiffness to the structure in the horizontal direction. Because FRP composite bridge designs are lightweight in nature, fundamental frequencies below 3 Hz (in the horizontal direction) should be avoided. Aspect ratios greater than 20 should also be avoided.

When a pedestrian bridge is expected to have frequencies in the range of possible resonance (in either the vertical or horizontal directions) with people walking and/or running, the acceleration levels are dealt with to limit dynamic stresses and deflections. The basic intrinsic damping available in pedestrian bridges using conventional materials (steel, wood, concrete, and aluminum) is low and fairly narrow in range, with 1 percent damping being representative of most pedestrian bridges using these materials. For FRP composite bridges, 1% damping is considered very conservative. In general, due to the bolted nature of the connections used in FRP bridge structures, 2% to 5% damping is considered a more representative range for design.

It is suggested that the vertical and horizontal fundamental frequencies be different in value to minimize any potential amplification of stresses when combined together. In particular, this type of behavior can occur under equestrian loading conditions.


### 1.3.3 Allowable Fatigue Stress

Fatigue issues which are critical in steel design, do not apply to FRP composite bridges. This is due to the low modulus of elasticity, which results in bridge structures designed to meet serviceability requirements while exhibiting low levels of stress.

### 1.3.4 Minimum Thickness of FRP

The 0.25-inch (6.2-mm) minimum thickness value for closed structural tubular members minimizes potential fiber-blooming and ultraviolet degradation of the material.
The 0.375 inch (9.6 mm) minimum thickness value for open structural members and plates minimizes potential fiber-blooming and ultraviolet degradation of the material. It also minimizes any localized buckling effects that can potentially occur in the flanges and the webs of the shapes. It also helps in providing additional strength in the Z-direction of these members, which is relying on the strength of the resin in this direction.

1.3.5 Connections
Bolted connections have been extensively tested and documented for FRP composite structures. Adhesive bonding alone (though possible) is not recommended due to the lack of testing done to date in this area. Adhesive bonding can be used in conjunction with bolted connections for all main members and secondary members to provide additional redundancy within the bridge system. Nonstructural members, which include intermediate railings, toe plates, rub rails, etc., can be either bolted/screwed or adhesively bonded.

1.3.6 Half-Through Truss Spans
This article modifies the provisions of AASHTO Article 10.16.12.1 by replacing the 300 pounds per linear foot (4.41 kN/m) design requirements for truss verticals with provisions based on research by Holt and others. These provisions establish the minimum lateral strength of the verticals based on the degree of elastic lateral support necessary for the top chord to resist the maximum design compressive force.

The use of 2.0 times the maximum top chord design load to determine the critical buckling force in the top chord is in recognition that under maximum uniform loads, maximum compressive stresses in the to chord may occur simultaneously over many consecutive panels. For a discussion on this, refer to T.V. Galambos’ Guide to Stability Design Criteria for Metal Structures.

For sustained snow load conditions (duration of load a minimum of 3 days) greater than 65 psf (3.11 KPa), it is recommended that 3.0 times the maximum top chord design load be used to determine the critical buckling force in the top chord. Adverse viscoelastic behavior (creep buckling) could potentially occur in the top chord. This conservative criteria is based on Creep Bending and Buckling of Linearly Viscoelastic Columns by Joseph Kempner, National Advisory Committee for Aeronautics, Technical Note 3136, Washington, 1954. The research addresses the viscoelastic problems associated with compression members, which exhibit initial curvature. This initial curvature can result from manufacturing tolerances, fabrication issues, and/or assembly procedures. Once this curvature is built into the system, adverse viscoelastic behavior can occur if the bridge structure is subjected to unaccounted for sustained load conditions.
Appendix C—CSI Specifications for FRP Pedestrian Bridges

The following CSI specification is a sample for a Pedestrian Bridge Specification written by E.T. Techtonics, Inc.

FRP PREFABRICATED BRIDGE SPECIFICATIONS

1.0 GENERAL

1.1 Scope
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 by E.T. Techtonics, Inc.; P.O. Box 40060; Philadelphia, PA 19106; phone 215-592-7620; or approved equal.

1.2 Qualified Suppliers
The bridge manufacturer shall have been in the business of design and fabrication of bridges for a minimum of 5 years and provide a list of five successful bridge projects, of similar construction, each of which has been in service at least 3 years. List the location, bridge size, owner, and contact reference for each bridge.

2.0 GENERAL FEATURES OF DESIGN

2.1 Span
Bridge span will be xxx’ xx” (straight line dimension) and shall be measured from each end of the bridge structure.

2.2 Width
Bridge width shall be xx’ xx” 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 or FRP Composite Cable 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 bridge structure(s) shall be performed by or under the direct supervision of a licensed professional engineer and done in accordance with recognized engineering practices and principles.
3.1 Uniform Live Load
Bridges spanning less than 50'0" will be designed for 85 psf. Bridges spanning greater than 50'0" will be designed for 60 psf unless otherwise specified.

3.2 Vehicle Load (as required)
A specified vehicle configuration determined by the operating agency may be used for the design vehicle. If an agency design vehicle is not specified, the loads conforming to the AASHTO Standard H-Truck is used. The maintenance vehicle live load shall not be placed in combination with the pedestrian live load. A vehicle impact allowance is not required.

3.3 Wind Load
All bridges shall be designed for a minimum wind load of 25 psf. The wind is calculated on the entire vertical surface 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 used for the design of all structural members. Factors of safety used by E.T. Techtonics, Inc. in the design of FRP bridges are as follows unless otherwise specified (based on the Ultimate Strength of the FRP material):

<table>
<thead>
<tr>
<th></th>
<th>2.5</th>
<th></th>
<th>2.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tension:</td>
<td></td>
<td>Bending:</td>
<td></td>
</tr>
<tr>
<td>Compression:</td>
<td>2.5</td>
<td>End bearing:</td>
<td>2.5</td>
</tr>
<tr>
<td>Shear:</td>
<td>2.5</td>
<td>Connections:</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Above information is based on E.T. Techtonics, Inc.’s 5-year test program funded by the National Science Foundation.

3.6 Serviceability Criteria
Service loads are used for the design of all structural members when addressing deflection and vibration issues. Criteria used by E.T. Techtonics, Inc. in the design of FRP bridges are 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 Hz to avoid any issues with the first and second harmonics.

Horizontal frequency \( (f_n) = 3.0 \) 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:

<table>
<thead>
<tr>
<th>Property</th>
<th>Tension: 33,000 psi</th>
<th>Bending: 33,000 psi</th>
<th>Compression: 33,000 psi</th>
<th>Young's Modulus: 2,800,000 psi</th>
<th>Shear: 4,500 psi</th>
</tr>
</thead>
</table>

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 is No. 2 southern yellow pine treated according to the American Wood Preservers Bureau. The standard 2- by 10-in planks are provided for pedestrian and bicycle type loading conditions. Standard 3- by 12-in planks can be provided for equestrian and light vehicle type loading conditions as required. High-strength, E-glass/isophthalic polyester resin planks or recycled plastic deck planks can also be provided as required.

#### 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 the client for their review after receipt of order. As required, all drawings shall be signed and sealed by a licensed professional engineer.

5.2 Submittal Calculations
As required, structural calculations shall be submitted to the client. All calculations will be signed and sealed by a 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 $\frac{1}{16}”$. No material deviations beyond industry standards are accepted. All cut edges to be cleaned and sealed.

7.0 RAILINGS

7.1 Railings for pedestrian and equestrian use should be a minimum of 42” above the floor deck and bicycle use should be a minimum of 54” above the floor deck.

7.2 Safety Rails
Continuous horizontal midrails shall be located on the inside of the trusses. Maximum opening between the midrails shall be available as required, but should not be greater than 9”. If preferred, vertical pickets can be provided upon request.

7.3 Toeplates (Optional)
Park and trail bridge toeplates (if required) are 3” green channels. Industrial catwalks use standard 4” yellow toeplate shapes unless otherwise specified.

8.0 FINISHING

Bridge color shall be determined by client with green, grey, beige, and safety yellow as standard. No painting is required as the color is added during the manufacturing process. Green is recommended for park and trail bridge applications. Grey, beige, and safety yellow for industrial catwalk applications. Custom colors can be provided upon request.
9.0 DELIVERY AND ERECTION

Delivery is made by truck to a location nearest the site accessible by roads. E.T. Techtonics, Inc. will notify the client in advance of the expected time of arrival at the site. Bridges are usually shipped to the site in component parts or partially assembled depending on site requirements. The spans can then be completely assembled using standard hand tools. Upon request, bridges can also be shipped totally assembled to the site. Unloading, splicing (if required) and placement of the bridge will be the responsibility of the client.

9.1 Erection Direction
For bridges shipped in component parts or partially assembled, E.T. Techtonics, Inc. 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 client. For bridges shipped assembled, E.T. Techtonics, Inc. shall advise the client of the actual lifting weights, attachment points and all necessary information to install the bridge.

9.2 Site Issues and Foundation Design
The client shall procure all necessary information about the site and soil conditions. Soil tests shall be procured by the client. The engineering design and construction of the bridge abutments, piers and/or footing shall be by the client. E.T. Techtonics, Inc. will provide the necessary information pertaining to the bridge support reactions. The client shall install the anchor bolts in accordance with E.T. Techtonics, Inc’s anchor bolt spacing dimensions.

10.0 WARRANTY

E.T. Techtonics, Inc. shall warrant the structural integrity of all FRP materials, design and workmanship for 15 years.

This warranty shall not cover defects in the bridge 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.

E.T. Techtonics, Inc.
P.O. Box 40060
Philadelphia, PA 19106
Phone and fax: 215-592-7620