

BENZIE COUNTY ROAD COMMISSION

SPECIAL PROVISION FOR STRUCTURE, TIMBER - DELIVER

KPM:PJM

1 of 3

06/12/18

a. Description:

Design, fabricate and deliver a timber bridge as shown on the Engineer's plans. The bridge must have the rise, span, width, skew angle and minimum waterway opening as shown on the plans. Larger spans, widths or other dimensions must be approved by the Engineer.

The fabricator shall be regularly engaged in the design and production of the specified product or item, and be able to furnish independent records or certification of competency upon request of the Engineer. Certification of the fabrication process shall be performed by a third party inspection agency that is accredited by the American Lumber Standards Committee (ALSC), as specified in the ALSC Treatment Wood Program.

b. Design:

The design of this structure shall be based on the current AASHTO LRFD Bridge Design Specification HL-93 Loading. Live Load plus dynamic load allowance deflection shall not exceed 1/425 of span length. Certify that the timber bridge was designed according to AASHTO LRFD Bridge Design Specifications and Michigan Department of Transportation (MDOT) 2012 Standard Specifications for Construction. Include Design calculations for the entire bridge with the certification.

The bridge design shall address loading, substructure configuration, superstructure configuration, railings, connections, etc. Design procedures, analysis and safety factors shall be according to AASHTO LRFD Bridge Design Specifications.

Design a substructure that will be supported on driven timber piles. Pile capacity, number and layout of piles, and estimated pile penetrations are shown on the Engineer's plans. Submit design calculations for the pile caps, backing planks and pile stays (if necessary).

Deck width shall be comprised of multiple panels. Glu-laminated panels will not be allowed. Design the deck in accordance with the following criteria

1. Unless otherwise specified, all dead loads, applied loads and live loads shall be as specified in the AASHTO LRFD Bridge Design Specifications.
2. Dead load shall include a sloped HMA wearing surface installed over the top of the deck panels as shown on the plans. The HMA application rate shall average 313 #/syd, with a minimum 1.2% cross slope for drainage.
3. Live Loads shall be HL-93. The vehicles shall be positioned to produce the maximum load effect.
4. Deflection requirements shall be in accordance with AASHTO.
5. Individual component dimensions shall be determined by the manufacturer.

Design the 4" x 10" timber railing as part of the deck panel system. Connect rail components to the superstructure only. No connection of the rail components to the substructure will be permitted.

The design, design calculations, load rating and certification must be sealed by a Licensed Professional Engineer registered in the State of Michigan.

c. Rating:

Prior to manufacturing, perform Load Ratings on the timber bridge according to the AASHTO Manual of Bridge Evaluation, Section 6, Part A, the most recent Michigan Bridge Analysis Guide and the Michigan Structure Inventory and Appraisal Guide. The following ratings should be calculated:

1. The Inventory Rating, National Bridge Inventory (NBI), Item 66
2. The Operating Rating, NBI Item 64
3. The Michigan Operating Rating, MDOT Item 64M
4. The Michigan Overload Class, MDOT Item 193

Perform the above Load Ratings using as-designed conditions, and assuming the wearing surface has been placed. Prior to manufacturing, deliver the following **to the Engineer for review and confirmation that the bridge will be fully open**, in paper or pdf electronic format for each load rating case:

- Assumption Sheet – Any assumptions made in the analysis shall be listed
- Program or calculation Input and Output
- A completed Bridge Analysis Summary Form

After construction, review the load rating for as-constructed conditions. Perform the load ratings using as-constructed condition, with the wearing surface in place. Deliver the following to the Engineer, in paper or pdf electronic format for each load rating case:

- Assumption Sheet – Any assumptions made in the analysis shall be listed
- Program or calculation Input and Output
- A completed Bridge Analysis Summary Form

All load ratings must be sealed by a Licensed Professional Engineer registered in the State of Michigan.

d. Shop Drawings and Bridge Plans:

Furnish the Engineer with shop drawings and details of all deck, pile cap, backing planks and railing components for approval. Include with the shop drawings the Load Ratings used as-designed conditions, the physical dimensions, methods of manufacture, recommended installation procedure, design assumptions, design loads and design calculation. Submit the shop drawings to the Engineer for review at least 21 calendar days prior to fabrication. Do not begin fabrication until written approval of the shop drawings has been received from the Engineer. No extension of time for additional compensation will be granted to the Contractor due to delays in design and/or preparing shop drawings and specifications.

Bridge Plans shall include all details, dimensions, quantities and cross-sections necessary to construct the entire bridge, and shall include but not be limited to the following items:

1. Specifications and construction notes
2. General bridge plan and elevation views
3. Abutment plan and elevation view

4. Section at an abutment
5. Section at a spreader beam
6. Section at a railing post

Show number and spacing of drive spikes on the bridge plans.

The design, shop drawings and bridge plans shall be sealed by a Licensed Professional Engineer registered in the State of Michigan.

The fabricator shall be responsible for design, fabrication and delivery of the entire timber bridge and for assisting the contractor with construction of the structure.

e. Materials:

Use only materials meeting the requirements of the 2012 MDOT Standard Specifications for Construction, Sections 709, 906, 908 and 912. All galvanized hardware shall be domestic.

Inspect all timber prior to treatment. Material shall be accepted after treatment on the basis of its condition prior to treatment, on the basis of inspection of the treatment procedure substantiated by plant records, on the condition of the material after treatment, and on absorption, penetration and visual inspection. So far as practical, do all adzing, boring, chamfering, framing, gaining, mortising, surfacing, general framing, etc., prior to treatment. Coat cut surfaces according to AWPA M4, if cutting or drilling must be done after treatment.

Pressure treat all piling substructure, superstructure and railing components with Copper Naphthenate per current Best Management Practices. All preserved wood shall be certified in compliance with BMPs by an independent third party.

f. Manufacture:

Assemble all deck panels in accordance with AASHTO and the 2012 MDOT Standard Specifications for Construction, Section 709, using 3/8" diameter ring shank dowels. Drive all dowels simultaneously and with equal force using a press the full length of the deck, ensuring all heads are flush with the surface of the timber plank. Do not use multiple impact tools to set dowels because of potential for wood fiber rupture.

Pre-drill all laminate decking for dowels prior to treatment to avoid the possibility of splitting, and to minimize violation of the treatment envelope. Certification of this process shall be performed by a third party inspection agency that is accredited by the ALSC, as specified in the ALSC Treated Wood Timber Program.

g. Measurement and Payment:

The materials will be paid for with the following pay items as summarized on the Bid Form:

<u>Pay Item</u>	<u>Unit</u>
Pile, Treated Timber, Furnish	Feet
Test Pile, Treated Timber, Furnish	Each
Structure, Timber - Deliver	Lump Sum

Payment for these items will be made upon delivery to the project site.