Timber Bridge (structure), Item SPV.0060.xx.

**A Description**

This special provision describes providing the design, detailing, fabrication, delivery, construction and erection of the timber bridge in accordance to the lines, dimensions, elevations, and details as shown on the plans and provided in the contract. Conform to standard spec part 507 as modified in this special provision.

**B Materials**

**B.1 Design Requirements**

Structural design of the bridge shall be by a professional engineer registered in the State of Wisconsin and experienced in timber bridge design. The manufacturer shall be regularly engaged in the production of the specified product or item and be able to furnish independent records or references of competence and satisfaction of this fact upon the request of the Owner. Calculations shall verify species, size and grade of materials to be used in the manufacture of the timber bridge.

Design the bridge according to the most recent edition of the following specifications except as modified herein.

1. AASHTO LRFD Bridge Design Specifications, all current interims,
2. Wisconsin Bridge Manual
3. American Wood Protection Association (AWPA) Standards, current edition
4. American Wood Council (AWC) National Design Specifications (NDS) for Wood Construction
5. American Institute for Timber Construction (AITC), Timber Construction Manual

**B.1.1 Timber Spike Laminated Deck Superstructure**

Timber spike laminated deck superstructure shall be a prefabricated longitudinal timber deck panel system as described in Chapter 23 of the WisDOT Bridge Manual.

Longitudinal deck panels shall be spike-laminated and span between supports. Deck width shall be comprised of multiple panels. Individual panel dimensions, thickness, species, and grade of timber shall be determined by the manufacturer.

Ship-lapped joint connections between adjacent panels shall be provided. Ship-lapped joints must be secured with drive spikes. The number and spacing of drive spikes shall be shown on design plans. Transverse spreader beams connecting multiple panels shall be provided and secured through the deck panels with bolts and locking hardware.

Timber wear plans for sidewalks, if shown in the plans, shall be 3-inch planks. Provide 3”x8” S1S1E (2-1/2” x 7-1/2”) or approved equivalent with rough side up.

Individual panel dimensions shall be determined by manufacturer.

Panel thickness, species and grade of timber shall be determined by manufacturer. The design and supply of materials for proper longitudinal deck panel connection to bridge substructure shall be the responsibility of the manufacturer and must be shown on the shop drawings.

**B.1.2 Timber Railing**

Timber rail system shall be included as part of longitudinal deck panel system. The rail system shall be crash-tested to Test Level 2 (TL-2) in accordance with NCHRP Report 350.

The connection of rail components shall be to the longitudinal deck panels only. No connection of rail components to substructures will be permitted.

**B.1.3 Timber Substructure**

The timber substructure design shall be the responsibility of the bridge manufacturer and shall be coordinated with the contract plans. The design shall be based on the bridge superstructure reactions resulting from all required loading conditions.

Timber bridge and substructure anchorage details shall be dictated by bridge manufacturer and must be shown in the shop drawings.

**B.2 Plan Requirements and Submittals**

Submit shop drawings and calculations to the engineer conforming to standard spec 105.2 with electronic submittal to the fabrication library under standard spec 105.2.2. Department review does not relieve the contractor from responsibility for errors or omissions on shop drawings. Submit no later than 90 days after date of notification to proceed with the project and a minimum of 30 days prior to the date proposed to begin bridge element fabrication.

The plans and shop drawings shall be prepared on reproducible sheets 11 inch x 17 inch, including borders. Each sheet shall have a title block in the lower right corner. The title block shall include the WisDOT project identification number and structure number. Design calculations and notes shall be on 8-1/2 inch x 11 inch sheets, and shall contain the project identification number, name or designation of the wall, date of preparation, initials of designer and checker, and page number at the top of the page. All plans, shop drawings, and calculations shall be signed, sealed and dated by a professional engineer licensed in the State of Wisconsin.

In the submittal, include the following:

1. Basic design criteria shown on the design plans.
2. Complete detailed drawings of all structural connections, sizes of members, span lengths between bearing points, skews, walkway widths, height of handrails and safety rails, bearing assembly details, anchorage locations and details, design data, materials data, and dead and live load bearing reactions.
3. Engineer’s certification. The plans shall be sealed, signed, and dated by a professional engineer registered in the State of Wisconsin.
4. One set of design calculations with independent checks, as well as a bridge rating file for future WisDOT use.

The department will return shop drawings from this submittal, and any subsequent submittals, to the fabrication library, either indicating acceptance or marked with required revisions and/or corrections.

**B.3 Structural Timber**

Lumber and timber shall meet the requirements of AASHTO M168. Glue laminated timber shall be manufactured using wet use adhesives.

Knotholes and holes from causes other than knots shall be measured and limited as provided for knots. All visible pieces of lumber and timber having knots that are unsightly in appearance shall be rejected. Cluster knots and knots in groups are not permitted.

Only pieces consisting of sound wood free from any form of decay shall be accepted. No piece of exceptionally lightweight timber shall be accepted.

Lumber and timber shall conform to the dimensions specified for either rough or surfaced stock.

Lumber and timber to be graded as per NFPA National Design Specifications for Wood Construction. All timber shall be grade #1 Coastal Douglas Fir, Southern Pine, or Hem-Fir.

**B.4 Preservative Treatment**

Preservative treatment of lumber and timber shall be by the pressure process, and unless otherwise provided in the contract special provisions, be in accordance AWPA Standards and AASHTO Designation M 133.

Lumber and timber shall be treated with Copper Naphthenate in Type A Hydrocarbon Solvent in accordance with AWPA P-36 and HSA-14 with retentions to meet AWPA UC4C. Other preservatives will not be accepted.

Unless otherwise directed by the Engineer the material shall be graded 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 practicable all adzing, boring, chamfering, framing, gaining, mortising, surfacing and general framing, etc., shall be done prior to treatment. If cut after treatment, coat cut surfaces according to AWPA M4.

All Douglas Fir and other species that are difficult to penetrate shall be incised prior to treatment.

**B.5 Hardware**

All hardware (machine bolts, carriage bolts, drift pins, lag screws, dowels, rods, nails, spikes, washers, connectors, etc.) shall conform to ASTM 307-97.

Unless a Dome Head Bolt or approved equal is used, all bolt heads or tightening nuts in contact with Structural Timber and lumber shall have a washer of sufficient thickness and bearing area to ensure a minimum deformation of the contacted surface when tightened to develop not more than the maximum allowable tensile stress of that bolt

Bolt heads or tightening nuts in contact with metal surfaces shall have a cut washer or approved equal placed between the bolt head or nut and the metal surface.

All hardware shall be hot-dipped galvanized in accordance with AASHTO M111-91.

**B.6 Timber Certification**

Solid sawn timber members shall conform to the requirements of the grading rules agency for the species, type, and grade specified in the plans or special provisions. Glued-Laminated members shall conform to the American Institute of Timber Construction 117-201 for the combination, species, use, and appearance as specified in the plans or special provisions. A Grading Agency Certification is required on all timber material.

**B.7 Manufacture**

All lumber and timber shall be straight, well sawed, sawed squared at ends and have opposite surfaces parallel unless otherwise required by the plans and specifications.

Deck panels shall be assembled with 3/8” diameter ring shank spikes. All spikes are to be simultaneously driven with equal force using a mechanical press the full length of the deck, ensuring all heads are flush with the surface of the timber plank. Multiple impact tools are not to be used to set spikes because of potential for wood fiber rupture.

Deck panels to be delivered to jobsite after being fully assembled at fabrication plant.

All plank for deck panels shall be precision end trimmed to length with 1/4” under length and no overlength tolerance permitted.

**B.6 Falsework and Bracing**

The engineer will not require the contractor to use new or unused materials in falsework or bracing.

Use timber in falsework and bracing of adequate strength and shape, suitable for the purpose intended. Use material that is in good condition, sound, and free from defects that might impair its strength.

Falsework or temporary bracing shall not require preservative treatment.

**C Construction**

**C.1 Delivery and Erection**

Deliver the bridge by truck to the location that is nearest to the site and accessible by road. The contractor is responsible for unloading the bridge from the trucks at the time of arrival.

The manufacturer shall notify the contractor in advance of the expected arrival time. Information regarding delays after the trucks depart the plant such as inclement weather, delays in permits, rerouting by public agencies, or other circumstances shall be passed on to the contractor as soon as possible.

The manufacturer shall provide an erection procedure to the contractor and shall advise the contractor of the actual lifting weights, attachment points, and all other information needed to install the bridge. Unloading, splicing, bolting, and providing proper lifting equipment as well as all tools, equipment, labor, and miscellaneous items required to complete the work is the responsibility of the contractor. The procedure for field splices shall be given to the contractor by the manufacturer.

**C.2 Workmanship**

Spikes shall be driven to set the heads flush with the surface of the wood, thus ensuring the surface shall be free from deep or frequent hammer marks. Properly pre-drill holes for screws, nails, spikes, lags or bolts where necessary to avoid splitting of timber.

**C.3 Handling**

Lumber and timber shall be handled with sufficient care to avoid breaking through portions penetrated by treatment, and thereby exposing untreated wood. Chains, peavies, cant hooks, pickaroons, timber dogs, pike poles and other pointed tools that would burr, blemish, penetrate or permanently deform the contacted member shall not be used. Rope, rubber or fabric slings shall be used.

**D Measurement**

The department will measure Timber Bridge (structure) as a single unit of work for each bridge, acceptably completed.

**E Payment**

The department will pay for measured quantities at the contract unit price under the following bid item:

ITEM NUMBER DESCRIPTION UNIT

SPV.0060 Timber Bridge (structure) EACH

Payment is full compensation for designing, manufacturing, transporting, and erecting the timber bridge; furnishing spikes, bolts, anchor bolts and all incidental items required for the Timber Bridge. The department will pay separately for the asphaltic wearing surface on the deck. (20230301)