# AASHTO PEDESTRIAN

# BRIDGE SPECIFICATION

## Purpose and scope

These specifications are for a fully engineered modular steel I-beam bridge and shall be regarded as the minimum standards for design and construction

## Qualified Supplier

Each bidder is required to identify the intended bridge supplier listed below as part of the bid submittal.

Pre-Approved Manufacturer

Custom Bridges and Boardwalks

Clinton, WI 53525-0279

(608) 676-2282

sales@custommfginc.com

## 1. GENERAL

### 1.1. BASIC INFORMATION

1.1.1. This specification is for a clear span bridge designed to carry pedestrians, trail maintenance equipment (tractor units, etc.) and snowmobile traffic.

1.1.2. CUSTOM is responsible for hiring a licensed Professional Engineer (PE), registered in the State of installation, to design and approve bridge and bridge end anchorage structures. Construction drawings stamped by the Engineer must be submitted to the Project Manager for approval prior to beginning construction if required

1.1.3. Owner has secured all necessary County/State erosion control/waterway/zoning permits.

### 1.2. SCOPE OF WORK

1.2.1. Design, furnish and install bridges, abutments, and approaches in accordance with the requirement of the specification as follows

1.2.2. CUSTOM shall be responsible for designing, detailing, fabrication, delivery, construction, and erection of the entire Trail Bridge with abutments and approaches.

### 1.3. REFERENCES

1.3.1. AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, 2009WI DNR

1.3.2. AASHTO LRFD Bridge Design Specifications, latest edition

1.3.3. AWS D1.1 Structural Welding Code – Steel, latest edition

1.3.4. Chapter NR 320 Bridges in or over Navigable Waterways

## 2. MATERIALS

### 2.1. STRUCTURAL STEEL

2.1.1. Square or rectangular tubing shall be cold-formed welded, unpainted, high strength, low alloy, and atmospheric corrosion resistant in accordance with ASTM A36 or A572

2.1.2. Steel beams shall be ASTM A709 W shapes.

2.1.3. All structural steel shall be grade 50 (Fy = 50,000 psi).

2.1.4. All structural steel shall be primed with red oxide primer, military standard TT-P-664D. Contractor to touch up in field as required.

2.1.5. *[OPTION]* After Priming, all structural steel should be painted with 2 coats of Sherwin Williams industrial enamel VOC Complying Oil Based Enamel Paint in a gloss finish. Finish should be applied following manufacturer's instructions for surface prep and finish painting. Color to be selected by the owner from the manufacturer's standard color charts.

2.1.6. Structural steel size shall be determined by Wisconsin licensed Professional Engineer (PE).

2.1.7. Welding shall meet the requirements of the American Welding Society, AWS D1.1

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## 2.2. STRUCTURAL TIMBER

2.2.1. This section shall include only such lumber and timber, as is part of the completed work. It shall not include falsework, forms, bracing, sheeting or other lumber and timber used for erection purposes.

2.2.2. Wood shall be MCA treated Southern Yellow Pine #1. Fresh cut ends of wood shall be treated to prevent deterioration.

2.2.3. All structural timber shall be in accordance with WISDOT Section 507.

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

2.2.5. Lumber and timber meeting the requirements of Structural Timber only shall be permitted.

2.2.6. All structural timber furnished shall conform to the dimensions specified for either rough or surfaced stock.

2.2.7. All timber to be graded as per NFPA 1991 National Design Specifications for Wood Construction.

2.2.8. PRESERVATIVE TREATEMENT

2.2.8.1. This section covers the wood preservatives and the preservative treatment of lumber, timber, piling, and posts conforming to the Specifications as referenced or otherwise specified in the plans or special provisions.

2.2.8.2. Preservatives and Preservative Treatments shall be in accordance with WISDOT Section 507.

2.2.8.3. So far as practicable all adazing, 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.

2.2.8.4. Railing components shall be treated with CCA or approved comparable treatments.

2.2.8.5. Structural deck shall be CCA or ACZA; Wear deck shall be CCA or approved comparable treatments.

2.3. HARDWARE

2.3.1. All hardware (machine bolts, carriage bolts, drift pins, lag screws, dowels, rods, nails, spikes, washers, connectors, etc.) shall conform to WISDOT Section 507.

2.3.2. 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

2.3.3. 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.

2.3.4. Only hardware chemically non-reactive to preservative treated lumber shall be used. ACZA treated lumber require hot dipped galvanized hardware.

# 3. FEATURES OF DESIGN

3.1. SPAN

3.1.1. Total span for the bridge shall be approximately _____ feet in length as measured in a straight line from each end of the bridge structure

3.1.2. Bridge shall be a clear span design with bridge anchorage structures on either end and no central support.

3.1.3. Contractor shall verify span. Location of new bridge anchorage structures shall not significantly change bridge span.

3.2. WIDTH

3.2.1. Width of usable bridge deck shall be a minimum of ___'. Usable bridge deck shall be defined as shortest distance across (perpendicular to centerline) bridge deck from any component above bridge deck.

3.3. ARCHED BRIDGE

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3.3.1. Bridge should be arched such that the slope of the bridge does not exceed ADA Slope requirements.

## 3.4. RAILINGS

### 3.4.1. Trail/Snowmobile Railing

3.4.1.1. Horizontal safety railings shall cover both sides of bridge for entire span of bridge.

3.4.1.2. Railings shall be a minimum of 42" above bridge deck.

3.4.1.3. Additional safety protection shall be installed between bridge deck and horizontal railing for the entire span length. Protection between deck and railings shall be designed to prevent a 6" sphere from passing through.

### 3.4.2. Pedestrian Railing

3.4.2.1. Safety Railings shall cover both sides of the bridge for the entire span of the bridge

3.4.2.2. Railing shall be a 42” or 54” above the bridge deck

3.4.2.3. Additional safety protection shall be installed between bridge deck and horizontal railing for the entire span length to prevent a 4” sphere passing through per ADA guidelines.

## 3.5. DECK

3.5.1. Bridge deck shall be wooden deck supported on structural steel and conform to WDNR loading guidelines. 2x10 decking typical

3.5.2. *[OPTION]* Second wear deck optional.

## 3.6. BRIDGE FOUNDATIONS

3.6.1. The owner shall procure all necessary information about the site and soil conditions. Soil tests shall be procured by the owner.

3.6.2. Portable Bridge Footings

3.6.2.1. Custom's modular portable footing system is protected via US Patent #US6421863B1

3.6.2.2. Portable footing size to be determined by the soil bearing capacity of the site

3.6.2.3. The Portable footings will be anchored into place by 2" x 5' long pipes at each footing

3.6.2.4. Additional anchors may be added for approaches or to provide additional retention in case of an extreme flood.

3.6.2.5. Portable footings may be installed at different elevations on both ends of the bridge.

3.6.2.6. Portable footings may include risers to elevate the bridge over navigable waterways or above flood levels.

3.6.3. Concrete and other Footing Designs

3.6.3.1. Design of bridge anchorage structure is responsibility of contractor

3.6.3.2. Acceptable bridge anchorage structure types include concrete wall bridge anchorage structures, helical pilings, or concrete piers. Bridge anchorage structures are to be designed by a registered professional engineer. Submit stamped drawings to Project Manager.

3.6.3.3. Concrete abutments shall be constructed at the same elevation on both ends.

3.6.3.4. Bearing plates are welded to the bottom of each beam. In addition there shall be a setting or slide plate placed on the abutment with a PTFE slide bearing placed on top between the slide plate and the bearing plate welded to the bottom of the beam

3.6.3.5. Unless specified otherwise, the bridge manufacturer shall determine the number, diameter, minimum grade and finish of all anchor bolts. The anchor bolts shall be designed to resist all horizontal and uplift forces to be transferred by the superstructure to the supporting foundations.

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3.6.3.6. Engineering design of the bridge supporting foundations, including design of anchor bolt embedment, shall be the responsibility of the foundation engineer. The contractor shall provide all materials for and construction of the bridge supporting foundations. The contractor shall install the anchor bolts in accordance with the manufacturer's bridge bearing dimensions.

3.7. Miscellaneous

3.7.1. All disturbed areas shall be seeded with Reinders No Mow/Low Grow (or equivalent) at rate of 6 lbs. per 1,000 sq. ft.

3.7.2. An urban/net free erosion control mat shall be placed over all newly seeded areas and stapled per manufacturer's instructions, including disturbed areas underneath bridge.

3.7.3. Contractor is responsible for ensuring design, materials, and method of construction meet DNR regulations.

# 4. ENGINEERING

Design of bridge and bridge anchorage structures shall be done by Professional Engineer registered in the state of installation.

4.1. Design Loads In considering design and fabrication, this structure should be assumed to be statically loaded. No dynamic analysis shall be required nor considerations for dynamically loaded structures be applied to the design or fabrication.

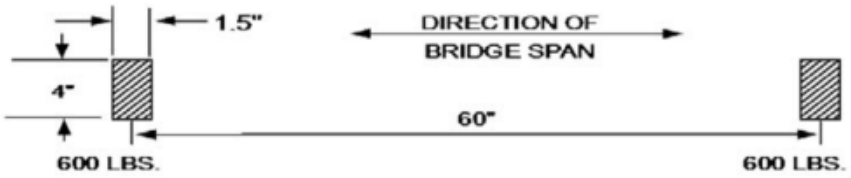
4.1.1. Dead loads The bridge structure shall be designed considering its own dead load (superstructure and original decking) only. No additional dead load shall be considered unless directly specified.

4.1.2. Pedestrian Live Load

4.1.2.1. A ninety pound (90 lbs.) per square foot live load shall be considered in the design and fabrication of all main supporting members. This load shall not be reduced and should be applied to those areas of the deck so as to produce maximum stress in the member being designed.

4.1.2.2. A ninety pound (90 lbs.) per square foot live load shall be considered in the design and fabrication of all secondary members. This load shall not be reduced and should be applied to those areas of the deck to produce maximum stress in the member being designed.

4.1.3. Vehicle Load The bridge superstructure, floor system, and decking shall be designed for the following point load conditions:




4.1.3.2. An occasional six thousand pound (6,000 lbs.) four wheeled vehicle where 80% of the load is considered to act on the rear axle and 20% on the front. All deck members and stringers shall be designed for a concentrated load of 30% of the vehicle.

All of the concentrated or wheel loads shall be placed so as to produce the maximum stress in the member being analyzed. Critical stresses shall be calculated assuming there is only one (1) vehicle on the bridge at any given time. Assumptions that vehicles only travel down the center of the bridge or that the vehicle load is a uniform line load shall not be allowed. Wheel Loads should be applied to a 20" x 10" Area per tire.

The vehicle impact allowance shall not be required.

4.1.4. Wind Load

4.1.4.1. Horizontal Forces The bridge shall be designed for a wind load as specified by AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, latest edition. The wind load shall be applied horizontally at right angles to the longitudinal axis of the structure.

The wind load shall be considered both in the design of the lateral load bracing system and in the design of the truss vertical member, floor beams, and their connections.

4.1.4.2. Overturning Forces The effect of forces tending to overturn structures shall be calculated assuming that the wind direction is at right angles to the longitudinal axis of the structure. In

addition, an upward force shall be applied at the windward quarter point of the transverse superstructure width. This force shall be twenty pounds (20 lbs.) per square foot of deck

4.1.5. Top Chord Railing Loads The top chord, vertical members, and floor beams shall be designed for lateral wind loads, per 3.1.4.1 Horizontal Forces, and for any loads required to provide top chord stability as outlined in 3.3.3 Top Chord Stability. In no case shall the load be less than fifty pounds (50 lbs.) per linear foot or a two-hundred-pound (200 lb.) point load, whichever produces greater stresses, applied in any direction at any point along the top cord, or at the top of the safety system (42" or 54" above the deck level) if higher than the top chord.

4.1.6. Safety Rails The safety rail system shall be designed for all infill loading of two hundred pounds (200 lbs.) applied horizontally at right angles, to a one (1) square foot area at any point in the system.

4.2. Design Limitations

4.2.1. Deflection

4.2.1.1. Vertical Deflection The Vertical Deflection of the main structures due to service pedestrian live load shall not exceed 1 three sixtieth (1/360) of the cantilever arm length.

The deflection of the floor beams due to service pedestrian live load shall not exceed on three-sixtieth (1/360) of the span

The deflection of the deck and stringers due to service pedestrian live load or Vehicle Load shall not exceed one thousandth (1/1000) of their respective spans

The service pedestrian live load shall not be reduced for deflection checks

4.2.1.2. Horizontal Deflection The horizontal deflection of the structure due to the lateral wind loads shall not exceed one three-sixtieth of the span

4.2.2. Vibration The fundamental frequency of the unloaded pedestrian bridge shall be no less than 3.0 Hz to avoid the first harmonic

4.2.3. Minimum Metal Thickness The minimum metal thickness of all structural steel members shall be three sixteenths (3/16") nominal and be in accordance with the AISC manual of Steel Constructions "Standard Mill Practice Guidelines".

4.3. Analysis

4.3.1. Load Combinations The loads listed shall be considered to act in the following combinations, whichever produce the most unfavorable effect on the bridge superstructure or structural member concerned.

DL = Dead Load, LL = Live Load, WL = Wind Load, VL = Vehicle Load

- Strength I
  - 1.25*DL+1.75*LL
  - 1.25*DL=1.75*VL
- Strength III
  - 1.25*DL+WL+OW
- Service I
  - DL+LL+WL+OW
- Fatigue I
  - Fatigue WL Only

The foundation engineering is responsible for determining any additional loads (i.e., earth pressure, stream force on abutments, wind loads other than those applied perpendicular to the long axis of the bridge, etc.) and load combinations require for design of the abutments.

4.3.2. Frequency Frequency analysis shall be completed to determine that the bridge frame is sufficient to avoid resonance due to frequencies likely encountered under normal use for the follow load combination in accordance with section 6 of the AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, latest edition.

4.3.3. Top Chord Stability The top chord of a half-through truss shall be considered as a column with elastic lateral supports at the panel points.

4.3.4. Bolted Splices Bolted Splice Design shall be in accordance with Section 6.13 of the AASHTO LRFD Bridge Design Specifications, current edition and in accordance with applicable sections of this document. Bolted field splices shall be located on the bridge to produce a structure which can be economically shipped and erected. Splices across the width of the bridge may be used, when necessary, to keep the overall structure width within reasonable limits for shipping

4.4. Local Requirements

4.4.1. Design shall conform with Wisconsin Department of Natural Resources (WDNR) guidelines and all applicable requirements for permitting by the state of Wisconsin.

4.4.2. Bridge shall have approximately 5 feet of navigational clearance beneath the center of the bridge

4.4.3. Bridge shall comply to any local requirements as supplied by the Owner.

4.5. Welding

4.5.1. Welding and weld procedure qualification tests shall conform to the provisions of ANSI/AWS D1.1 "Structural Welding Code, 2015 Edition. Filler Metal shall comply with the applicable WWS Filler Metal Specification.

# 4 - EXECUTION

5.1. ERECTION

5.1.1. Protect waterway from debris and pollution. All applicable county, state, and federal regulations must be followed.

5.1.2. Contractor responsible for erosion control methods and maintenance throughout project duration. Prior to project completion, all disturbed areas shall be temporarily covered with straw mulch by the end of the day prior to forecasted measurable rain events. All disturbed areas shall be permanently seeded and covered with urban/net free erosion control mat upon completion of the project.

5.2. INSTALLATION SITE AND STAGING

5.2.1. Owner should provide an approved staging area near to the bridge site to facilitate installation

5.2.2. Contractor shall be responsible for repairing damage to site and staging areas caused by equipment or materials.

5.3. REMOVAL AND DISPOSAL

5.3.1. _____ will remove existing bridge from site and place on site in a location approved by the owner.

5.3.2. _____ is responsible for disposal of existing bridge.

## 5.4. ROCK RIPRAP

5.4.1. Rock riprap shall be the responsibility of the bidding contractor. Plans shall include riprap quantities as well as locations. Each end of bridge shall be sufficiently riprapped to protect bridge abutments.

5.4.2. Rock riprap shall be graded so that the individual rock fragments shall be dense, sound and free from cracks, seams and other defects conducive to accelerated weathering. The rock fragments should be angular to sub rounded in shape. The least dimension of each individual rock fragments shall be not less than one-third the greatest dimension of the fragment. It should also be free from dirt, clay, sand, rock fines and other materials not meeting the gradation limits. Rock shall be excavated, selected and handled as necessary to meet the grading requirements for rock in a D50=8" gradation.

5.4.3. The subgrade surfaces on which the rip rap, filter or bedding material is to be placed shall be cut or filled and graded to prevent irregular surfaces along the length of the placed material. Any fill material used to bed the riprap shall be compacted in accordance with Wisconsin Construction Specification #3.

5.4.4. The surface of the finished product shall be spread uniformly on the prepared surface to a depth not exceeding 18 inches. The surfaces of the layers shall be finished reasonably free of mounds, dips or windrows and shall meet the gradation D50=8". Rock rip rap shall be placed to reasonably protect abutments.

## 5.5. SITE REGRADING

5.5.1. Re-grade bridge approaches and add ¾" crushed limestone as needed to allow smooth transition for snowmobiles and trail maintenance equipment (tractor units, etc.).