



RECREATIONAL VEHICLE

BOARDWALK SPECIFICATION

Purpose and scope

These specifications are for a fully engineered modular boardwalk and shall be regarded as the minimum standards for design and construction

Qualified Supplier

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

Pre-Approved Manufacturer

Custom Boardwalks 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 modular boardwalk designed to carry pedestrians, trail maintenance equipment (tractor units, etc.) and occasional light vehicle crossing.

1.1.2. CUSTOM is responsible for hiring a licensed Professional Engineer (PE), registered in the State of installation, to design and approve boardwalk 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 boardwalks 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 boardwalk with abutments and approaches.

1.3. REFERENCES

- 1.3.1. State of Wisconsin Department of Transportation "Standard Specifications for Construction", current edition
- 1.3.2. International Building Code, 2008 edition
- 1.3.3. WI DNR "Bridge Guidelines" New and Replacement Snowmobile and All- Terrain Vehicle bridges. - Current edition
 - 1.3.3.1. Wisconsin Department of Natural Resources (PUB-CF-005-2017)

2. MATERIALS

2.1. STRUCTURAL STEEL

- 2.1.1. Pans and brackets should be constructed of hot rolled steel with a galvanized finish
- 2.1.2. Steel beams shall be ASTM A709 W shapes.
- 2.1.3. All structural steel shall be grade 50 ($F_y = 50,000$ psi).
- 2.1.4. Structural steel size shall be determined by Wisconsin licensed Professional Engineer (PE).
- 2.1.5. Welding shall meet the requirements of the American Welding Society, AWS D1.1

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 TREATMENT

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 MCA or approved comparable treatments.

2.2.8.5. Structural deck shall be MCA; Wear deck shall be MCA 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.

3. FEATURES OF DESIGN

3.1. LENGTH

3.1.1. Total length of the boardwalk shall be approximately _____ feet in length as shown in the project plans

3.2. WIDTH

3.3. Width of usable boardwalk deck shall be a minimum of _____ feet. Usable boardwalk deck shall be defined as shortest distance across (perpendicular to centerline) boardwalk deck from any component above boardwalk deck.

3.4. FRAME PANELS

3.4.1. Boardwalk panels shall be designed using 2x8 treated lumber and appropriate fasteners and hangers to support the design loads.

3.5. RAILINGS

3.5.1. Curb Railing

3.5.1.1. Horizontal safety railings shall cover both sides of boardwalk for entire span of boardwalk.

3.5.1.2. Railings shall consist of a 2x4 spacer with a 2x4 bumper spaced at a maximum of 48"

3.5.1.3. Additional safety protection shall be installed between boardwalk 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.

3.5.2. Pedestrian Railing

3.5.2.1. Pedestrian Railings shall cover both sides of the bridge for any span of the boardwalk where the deck height is greater than 2' above grade

3.5.2.2. Railing shall be a 42" or 54" above the bridge deck

3.5.2.3. 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.

3.6. DECK

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

3.7. BOARDWALK FOUNDATIONS

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

3.7.2. Portable Boardwalk Footings

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

3.7.2.2. Portable footings may be installed at different elevations on both ends of the boardwalk.

3.7.3. Unless specified otherwise, the boardwalk manufacturer shall determine the number, diameter, minimum grade and finish of all anchor bolts.

3.8. Miscellaneous

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

3.8.2. 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 boardwalk.

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

4. ENGINEERING – BOARDWALK

Design of boardwalk and boardwalk anchorage structures shall be done by Professional Engineer registered in the

state of installation. Trail boardwalks are not to be considered part of highway/vehicular road systems.

Boardwalk footings must be designed to support designed deck (live) loads and structure (dead) loads.

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 boardwalk 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 sixty pound (60 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 sixty pound (60 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

4.1.3.1. An occasional **Four Thousand (4,000 lbs.)** four wheeled vehicles doing routine use and maintenance. Loadings shall be based on the "typical" equipment train weight (using individual weight, width, and wheel or track spacing loading).

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 boardwalk at any given time. Assumptions that vehicles only travel down the center of the boardwalk or that the vehicle load is a uniform line load shall not be allowed.

The vehicle impact allowance shall not be required.

4.1.4. Snow Load

4.1.4.1. A ____ pound (____ lbs.) per square foot snow load shall be considered in the design and fabrication of all supporting members in combination with other loads.

4.1.5. Wind Load

4.1.5.1. Horizontal Forces The boardwalk shall be designed for a wind load of twenty pounds (20 lbs.) per square foot applied to the net projected vertical surface.

4.1.6. Railing Loads The minimum design load for the railing is fifty pounds (50 lbs.) per linear foot, applied transversely and vertically, acting simultaneously on each longitudinal member.

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 ($1/360$) of their respective spans

4.2.1.2. Horizontal Deflection The horizontal deflection of the structure due to the lateral wind loads shall not exceed one three-sixtieth ($1/360$) of the span

4.2.2. Minimum Metal Thickness The minimum metal thickness of all structural steel members shall be three sixteenths ($1/8$ " nominal and be in accordance with the AISC manual of Steel Constructions "Standard Mill Practice Guidelines". Closed structural Tubular Members shall be a minimum of $1/4$ "

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 boardwalk superstructure or structural member concerned.

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

- $DL + .80*(LL + WL)$
- $DL + .75*(WL + VL)$

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

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. Boardwalk shall comply to any State and Local requirements as provided 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 boardwalk 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. SITE REGRADING

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