

## TIMBER PEDESTRIAN BOARDWALK AT STA. \_\_\_\_\_

(SPECIAL)

**1.0 GENERAL****1.1 Scope**

These specifications are for a fully engineered boardwalk of timber construction and shall be regarded as minimum standards for design and construction.

**1.2 Qualified Suppliers**

Boardwalks may be designed and constructed by any sufficiently experienced and qualified design engineer and Contractor.

**2.0 GENERAL FEATURES OF DESIGN****2.1 Span**

Boardwalk span(s) shall be at the length(s) shown on the plans.

**2.2 Width**

Boardwalk width shall be as shown on the plans. Widths less than 10'-0" clear between members or appurtenances on the deck of the bridge or boardwalk shall be approved by the NCDOT Bicycle and Pedestrian Division.

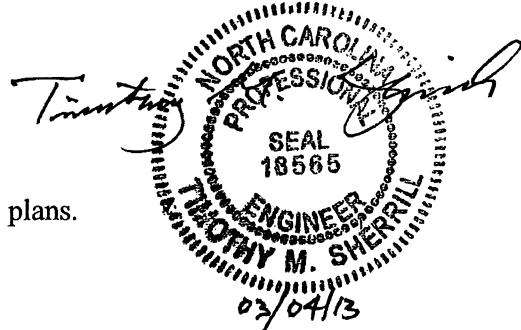
**2.3 Boardwalk System**

The boardwalk shall be designed as a timber boardwalk of sawn lumber, glued laminated timber, and/ or timber piles and poles. Typical construction should consist of beams between foundation piles or poles, with joists that span between the beams, along the length of the boardwalk. Decking is attached to the joists and beams. Boardwalks are anticipated to be "stick-built" on site, although portions may be prefabricated and set in place on site.

- The boardwalk shall be designed in accordance with the latest AASHTO *LRFD Guide Specifications for Design of Pedestrian Bridges*.
- The top of the safety system or guardrail elements shall not be less than 54 inches above the deck elevation (measured from the high point of the riding surface) of pedestrian path, and shall meet all requirements of AASHTO and NCDOT. If there is a conflict between standards, the stricter requirement shall apply. The safety system shall extend the full length of the bridge.
- Approach rails to the boardwalk shall be provided. See Figure 7-14 of NCDOT *Bicycle Facilities Planning and Design Guidelines* for recommended layout.
- It is anticipated that a boardwalk would be used for multiple spans and for spans of approximately 16 feet and less.

**3.0 ENGINEERING**

Structural design of the boardwalk 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. The Engineer shall be licensed to practice in North Carolina.

### 3.1 Design Loads

Design Loads shall be in accordance with the latest AASHTO *LRFD Guide Specifications for Design of Pedestrian Bridges*. In addition to the Pedestrian Live Load, the boardwalk shall be designed for a vehicular load of:

Less than 7' clear deck width:	No Vehicle Load Required
7' to 10' clear deck width:	AASHTO H-5 Truck
Greater than 10' clear deck width:	AASHTO H-10 Truck

### 3.2 Design Limitations

#### 3.2.1 Deflection

##### 3.2.1.1 Vertical Deflection

The vertical deflection of the members due to service pedestrian live load shall not exceed  $1/360$  of the span.

The vertical deflection of cantilever spans of the structure due to service pedestrian live load shall not exceed  $1/220$  of the cantilever arm length.

The deflection of the floor system secondary members (stringers, etc.) due to service pedestrian live load shall not exceed  $1/360$  of their respective spans.

##### 3.2.1.2 Horizontal Deflection

The horizontal deflection of the structure due to lateral wind loads shall not exceed  $1/360$  of the span.

### 3.3 Governing Design Codes / References

Structural members shall be designed in accordance with recognized engineering practices and principles as follows:

#### 3.3.1 Structural Steel Allowable Stresses

American Association of State Highway and Transportation Officials (AASHTO)

Allowable Design Stresses shall be in accordance with the AASHTO *LRFD Bridge Design Specifications*, latest edition.

#### 3.3.2 Laminated Wood Construction

American National Standards Institute / American Institute of Timber Construction (ANSI/AITC) *National Design Specification (NDS) for Wood Construction*.

#### 3.3.3 Timber

American National Standards Institute / American Institute of Timber Construction  
(ANSI/AITC) *National Design Specification (NDS) for Wood Construction*.

## 4.0 MATERIALS AND INSPECTION

### 4.1 Timber

Unless stated otherwise and confirmed through design calculations, lumber, timber, posts, and piles shall meet all requirements of NCDOT Standard Specification Section 1082.

#### 4.1.1 Timber Decking

4.1.1.1. Timber decking shall be Southern Pine Lumber, #1 Grade per SPIB, pressure treated in accordance with AWWA Standard U1 for above ground use. All planks shall be supplied with the end sealed with "Anchorseal" Mobil CER-M or an equal aqueous six log sealer.

#### 4.1.1.2 Timber Decking Attachment

- At time of installation, planks are to be placed with a maximum of 1/8" gap between planks.
- Every plank must be attached with at least two fasteners at each end.
- All fasteners shall be galvanized as per NCDOT *Standard Specifications*. Carriage bolts or self-tapping screws are to be used to attach the planks to joists and/or beams. Powder actuated fasteners will not be allowed.
- Planks are to be drilled prior to installation of bolts and/or screws to prevent splitting.

### 4.2 Galvanizing

All steel and hardware required for the boardwalk, including anchor bolts and/or leveling pads shall be hot-dipped galvanized in accordance with NCDOT *Standard Specifications*.

### 4.3 Concrete

All concrete required for the boardwalk shall meet all requirements of NCDOT Standard Specification Section 1000.

## 5.0 FOUNDATIONS

### 5.1 General

Design for boardwalk shall include foundation design.

All geotechnical data, tests, computations and supporting subsurface investigations and documentation submitted by the Contractor shall be provided in English Units.

Obtain the services of a firm prequalified for geotechnical work by the NCDOT Geotechnical Engineering Unit at:

<https://partner.ncdot.gov/VendorDirectory/default.html>

The prequalified geotechnical firm shall perform the subsurface exploration in accordance with the current NCDOT Geotechnical Engineering Unit Guidelines and Procedures Manual for Subsurface Investigations and shall prepare a foundation design recommendation report. The Contractor shall provide the final Subsurface Investigation and Foundation Recommendations Reports in electronic and hardcopy format to the NCDOT for its records.

The maximum spacing for borings for the boardwalk shall be 75 feet, with a minimum of two borings, one at each end. Extend all borings to a depth below the foundation element required to show a complete subsurface profile.

5.2 Foundations

As required by boardwalk loads, subsurface geotechnical information, and surrounding conditions, foundations may be shallow foundations, or deep foundations consisting of driven or drilled in piles.

6.0 SUBMITTALS

6.1 Submittal Drawings

Schematic drawings and diagrams for the boardwalk superstructure, substructure, and foundations shall be submitted to the NCDOT for review. Submittal drawings shall be unique drawings, prepared to illustrate the specific portion of the work to be done. All relative design information such as member sizes, bridge reactions, connection details, and general notes shall be clearly specified on the drawings. Drawings shall have cross-referenced details and sheet numbers. All drawings shall be signed and sealed by a Professional Engineer who is licensed in North Carolina.

6.2 Structural Calculations

Structural calculations for the boardwalk superstructure, substructure, and foundations shall be submitted to the NCDOT for review. All calculations shall be signed and sealed by a Professional Engineer who is licensed in North Carolina. The calculations shall include all design information necessary to determine the structural adequacy of the bridge and all of its components.

7.0 MEASUREMENT AND PAYMENT

The cost of design, installation, and construction is included in the lump sum price bid for *Timber Pedestrian Boardwalk at Station \_\_\_\_\_*. This price is full compensation for furnishing all design plans and calculations; furnishing all timber, concrete, hardware, and other materials; furnishing all installation, erection, and construction; protecting work area, traffic and property; and furnishing all other requirements necessary for the design, installation, and construction of the boardwalks indicated on the plans.

Payment will be made under:

**Pay Item**  
Timber Pedestrian Boardwalk at Station \_\_\_\_\_

**Pay Unit**  
Lump Sum