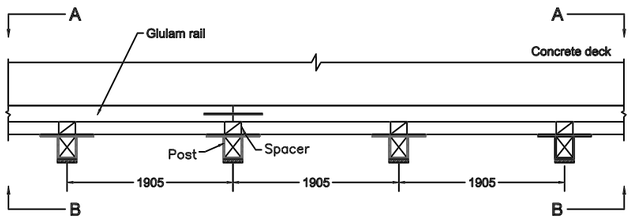
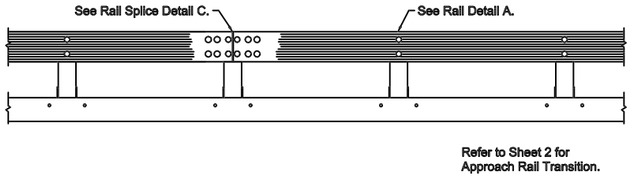
General Configuration

All units are in millimeters based on a soft conversion from customary U.S. units.



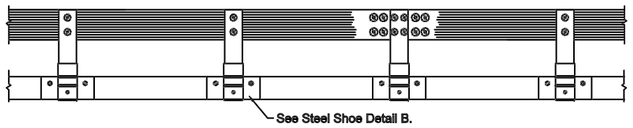
Plan View

Section A-A



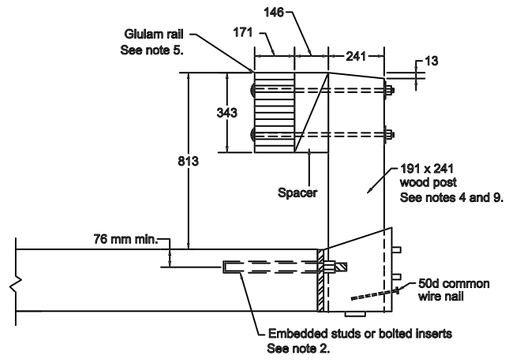
Front Elevation

Section B-B

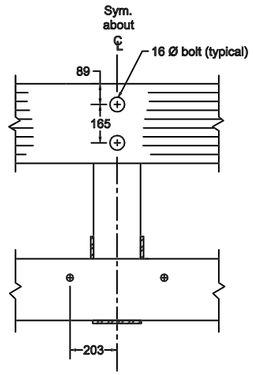


Back Elevation

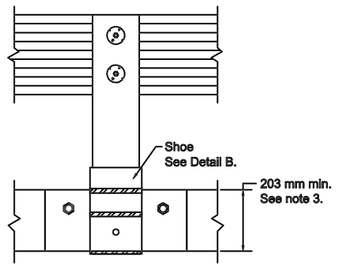
A Railing Details



End View

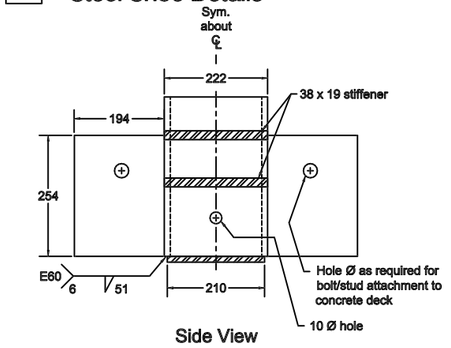


Front View

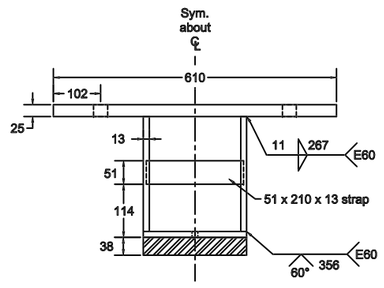


Back View

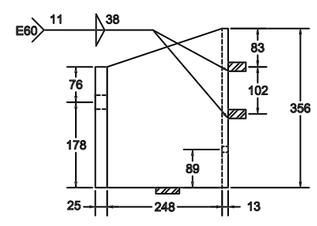
B Steel Shoe Details



Side View

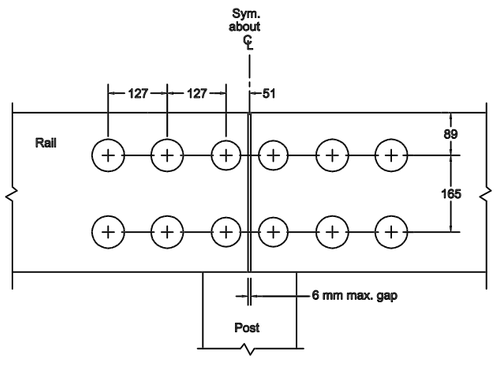


Plan View

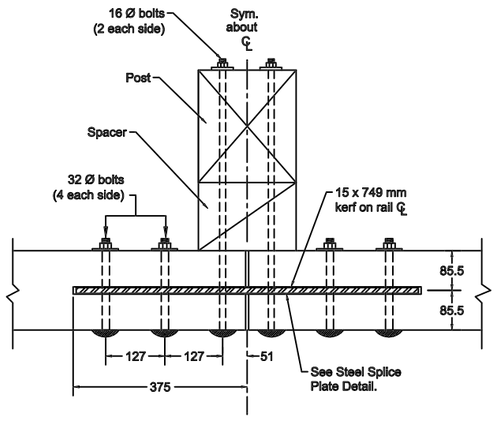


End View

C Rail Splice Details

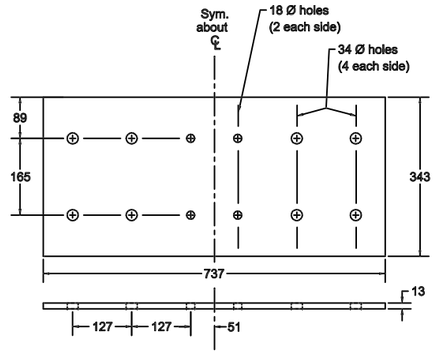


Side View



Plan View

Steel Splice Plate



Design

1. This bridge railing was successfully crash tested on a longitudinal wood deck to the requirements for Performance Level 1 (PL-1), as outlined in the AASHTO (1989) Guide Specifications for Bridge Railings. This railing has also been certified by the FHWA to meet requirements for Test Level 2 (TL-2) in accordance with NCHRP Report 350. Adaptation of this railing from a longitudinal wood deck to a concrete deck is based on test measurements and the ultimate capacity of deck attachment hardware.

2. Steel shoe for each post shall be attached to the concrete deck with two connections, such as bolted inserts or embedded studs. Each connection shall provide a minimum ultimate capacity of 222.4 kN in tension. Internal reinforcement of the concrete deck shall be designed accordingly to resist these ultimate loads.

3. Concrete deck edge thickness shall be a minimum of 203 mm to provide bearing for the steel shoe plate.

4. Dimensions for the wood rail, post, and spacer are actual dimensions. Post dimensions correspond to the standard dressed dimensions for a nominal 203- by 254-mm member that is surfaced on four sides (S4S 1989).

5. Depth of the glued-laminated (glulam) timber rail may be increased to a maximum of 349 mm to allow for standard glulam timber sizes. In such cases, detail dimensions shall be verified and modified accordingly.

6. Rail splices shall be located so that rail members are continuous over not less than four posts. It is recommended that the rail be continuous over the length of the bridge.

Materials

7. Sawn lumber and glulam shall comply with the requirements of AASHTO M168 and shall be pressure treated with wood preservative in accordance with AASHTO M133.

8. Bridge rail shall be horizontally laminated glulam, visually graded western species Combination No. 2, or visually graded Southern Pine Combination No. 48. Other species and grades of glulam may be used, provided the minimum tabulated values are not less than the following:
F_{bv} = 12.4 MPa E = 12,410 MPa

9. Posts and spacer blocks may be sawn lumber or glulam. When sawn lumber is used, material shall be visually graded No. 1 Southern Pine or visually graded No. 1 Douglas Fir-Larch. Glulam and other species and grades of sawn lumber may be used, provided the minimum tabulated values are not less than the following:
F_b = 9.3 MPa E = 10,342 MPa

10. Steel plates and shapes shall comply with the requirements of ASTM A36.

11. Bolts shall comply with ASTM A307 requirements, Grade 2, and should preferably be dome-head timber bolts. Bolts on the rail traffic face shall be dome head.

12. All steel components and fasteners shall be galvanized in accordance with AASHTO M111 or M232 or shall otherwise be provided with adequate corrosion protection.

Fabrication and Construction

13. Welding shall be completed in accordance with the requirements of ANSI/AASHTO/AWS D1.5 Bridge Welding Code.

14. To the extent possible, all wood shall be cut, drilled, and completely fabricated prior to pressure treatment with preservatives. When field fabrication of wood is required or if wood is damaged, all cuts, bore holes, and damage shall be immediately field treated with wood preservative in accordance with AASHTO M133.

15. Unless noted, malleable iron washers shall be provided under bolt heads and under nuts that are in contact with wood. When the size and strength of the head are sufficient to develop connection strength without wood crushing, washers may be omitted under heads of dome-head timber bolts.

16. Tops of rail posts and top of the rail splice plate kerf shall be sealed with roofing cement or otherwise protected from direct exposure to weather.

The bridge railings depicted on these drawings were developed and crash tested under a cooperative research agreement between the Midwest Roadside Safety Facility of the University of Nebraska-Lincoln, the USDA Forest Service, Forest Products Laboratory, and the U.S. DOT Federal Highway Administration.

University of Nebraska Lincoln

Crash-Tested Wood Bridge Railings for Concrete Decks

Glulam Timber Rail without Curb
NCHRP 350 Test Level 2 (TL-2)

August 1998