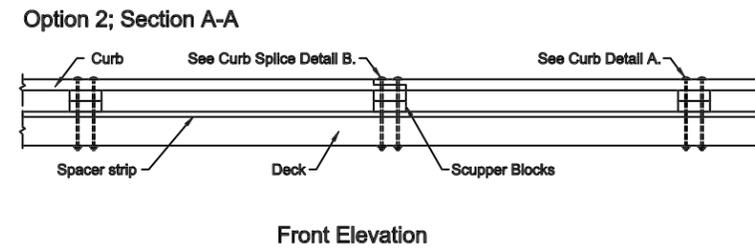
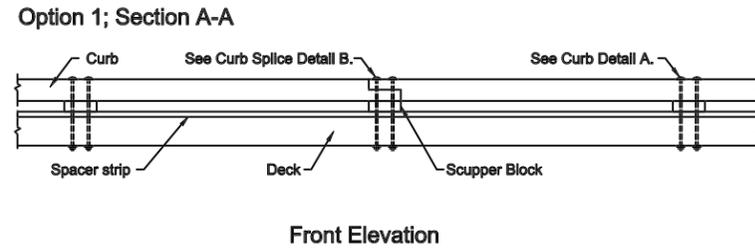
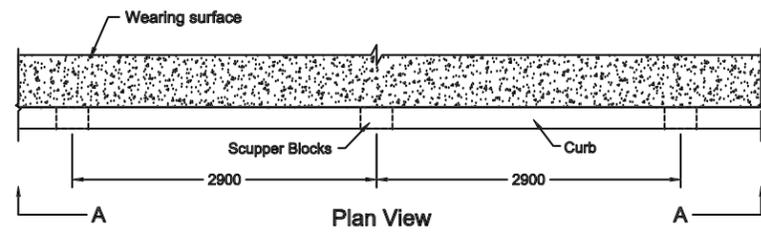
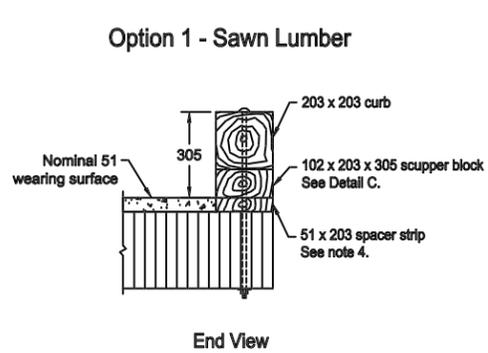


**General Configuration** All units are in millimeters based on a soft conversion from customary U.S. units.

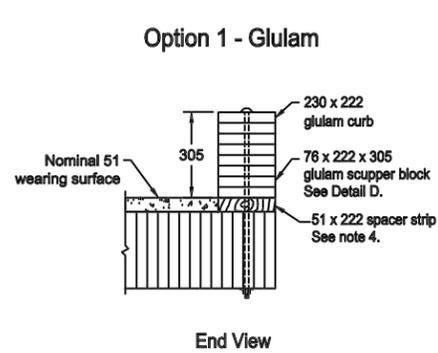


**A Curb Details**

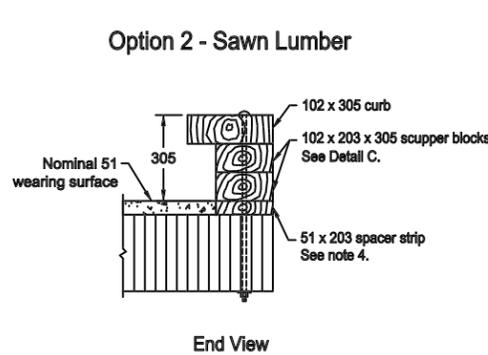
**Option 1 - Sawn Lumber**



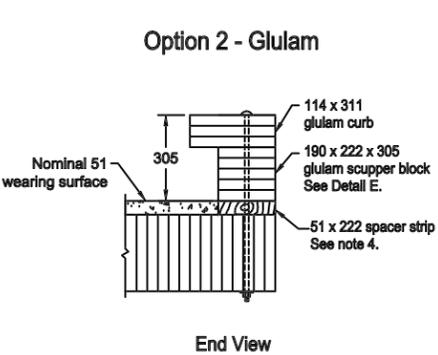
**Option 1 - Glulam**



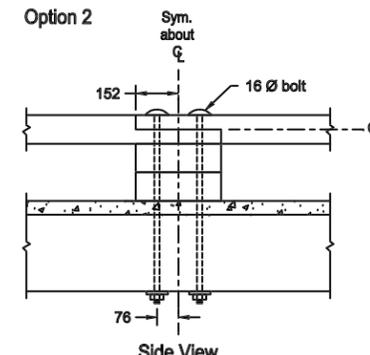
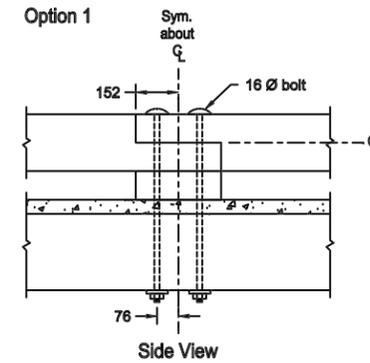
**Option 2 - Sawn Lumber**



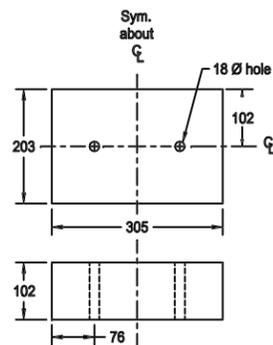
**Option 2 - Glulam**



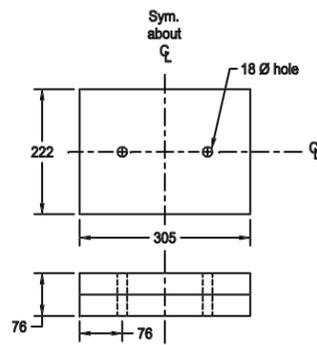
**B Curb Splice Details**



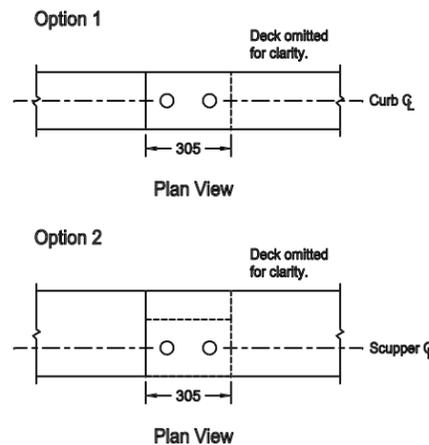
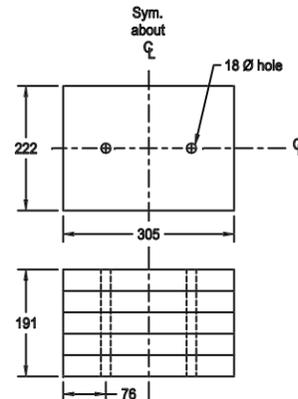
**C Scupper Block Detail**



**D Scupper Block Detail**



**E Scupper Block Detail**



**Design**

1. These curb railings were successfully crash tested for low-volume road applications using a 19.6 kN pickup truck test vehicle with an impact velocity of 24 kph and impact angle of 15 degrees. These railings are adaptable to longitudinal stress-laminated, spike-laminated, nail-laminated, and glued-laminated (glulam) timber decks that are 254 mm or greater in actual thickness. For additional information, refer to Development of Low-Volume Curb-Type Bridge Railings for Timber Bridge Decks (Ritter and others 1993).

2. Drawings include crash-tested designs for two curb railing options with details for both sawn lumber and glulam configurations. In all cases, the actual height of the curb railing shall be 305 mm above the traveled way (top of wearing surface or top of bridge deck if a wearing surface is omitted), but not greater than 356 mm above the bridge deck.

3. Scupper blocks are included in the curb railing designs to provide the required curb height and allow openings for deck drainage. Scupper blocks for either option may be sawn lumber or glulam and may require adjustment in the height dimension to achieve the actual curb height specified in Note 2 based on actual dimensions of the curb and scupper block members. In the case of the sawn lumber option 2, the two scupper blocks may be replaced with a single block of the required dimensions.

4. Each curb railing is shown with a 51-mm-thick continuous spacer strip intended to serve also as a retainer for an asphalt pavement wearing surface. If a lumber or gravel wearing surface is used, the strip should be under the scupper blocks only (not continuous) to allow for free deck drainage, or the strip may be eliminated and the scupper block height adjusted accordingly. If no wearing surface is used, the strip may be eliminated.

5. Dimensions for sawn lumber are nominal dimensions. Actual dimensions will vary depending on surfacing but shall not be less than 13 mm less than the stated nominal dimensions.

6. Dimensions for glulam are actual dimensions. The 222 mm standard glulam width may be decreased to a minimum 216 mm to allow for other standard glulam sizes. In such cases, detail dimensions shall be modified accordingly.

**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. Glulam shall be manufactured using wet use adhesives to an industrial appearance grade.

8. Curbs and scupper blocks may be sawn lumber or glulam. When sawn lumber is used, material shall be visually graded No. 1 Southern Pine or Douglas Fir-Larch. Glulam and other species and grades of sawn lumber may be used provided that the minimum tabulated values for the species and grade are not less than the following:

$F_b = 9.3 \text{ MPa}; E = 10,342 \text{ MPa}$

9. Bolts shall comply with the ASTM A307 requirements, Grade 2, and should preferably be dome head timber bolts. Bolts on the top of the curb rail shall be dome head.

10. 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**

11. 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 treated with wood preservative in accordance with AASHTO M133.

12. 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.

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 and the USDA Forest Service, Forest Products Laboratory.



**Crash-Tested Bridge Rails for Longitudinal Wood Decks on Low-Volume Roads**