CHAPTER 11
BRIDGE LAYOUT

11-1 General

Structure lengths, widths, and clearances shall be in agreement with the State of North Carolina, Department of Transportation, Division of Highways, Bridge Policy. Also, refer to the Structure Recommendations and the Policy and Procedure Manual.

In general, end bent slopes shall be 1½:1 in fill sections and 2:1 in cut and partial cut sections unless recommended otherwise by the Soils and Foundation Section. In Divisions 1, 2 and 3, consult with the Soils and Foundation Section for the recommended end bent slopes prior to laying out the bridge.

11-2 Stream Crossings

The minimum grade on a structure shall be 0.2%. Any proposed grade less than 0.2% shall be discussed with the Roadway Design Unit.

The minimum clearance between the bottom of the beams or girders and the design high water elevation shown on the Bridge Survey Report should be 2 feet (600 mm) for all interstate and arterial roads and 1 foot (300 mm) for all other roads.

If practical, skewed bridges on horizontal curves with a repetitious span arrangement should have all bent worklines set ~~at a constant skew angle at their point of intersection with the curve~~at a constant skew angle at their point of intersection with the curve.

Slopes shall be normal to the end bent cap. Final consideration of the rate of slope and slope protection will depend upon the Hydraulic Design.

The Hydraulics Unit computes the span lengths based on the details of Figures 11-1 through 11-3. In general, a 1 foot (300 mm) minimum earth berm shall be used.

Changes to grade, span arrangement or superstructure type that would affect the waterway opening beneath the structure should not be made without first obtaining approval from the Hydraulics Unit.

11-3 Grade Separations

End bent slopes should be normal to the ditch beneath the structure unless specific conditions dictate otherwise. A 1 foot (300 mm) wide berm 1'-6" (450 mm) above the bottom of cap shall be provided. In a combination cut and fill slope, a 3 foot (1.0 m) berm normal to the cut slope should be provided at the toe of the fill. This berm is not required when slope protection is used and/or where 2:1 slopes are used. See Figure 11-4 for berm details.

When slope protection is used, the berm shall be sloped away from and normal to the cap at a rate of ½ in/ft (50 mm/m). The proper berm width should be used in determining the length of bridges. The berm widths should be computed for both ends of both end bents. These berm widths and elevations should be shown on the General Drawing and on the slope protection standard drawings.

The toe of the slope should intersect the centerline of the ditch shown on the Structure Recommendations.

Consult with the Roadway Design Unit when the vertical clearance does not meet the requirements as provided in the Structure Recommendations and the NCDOT Bridge Policy.

11-4 Railroad Overheads

Structures over railroads must provide horizontal clearances ~~which~~ that meet the approval of the applicable railway company and shall be in conformity with the Federal Aid Policy Guide. Figure 11-5 shall be used to set the bridge length for both CSX and Norfolk Southern Railroads. These clearances may be changed to reflect individual site conditions as requested by the railroad, provided they meet the criteria outlined in the Policy Guide. The Policy and Procedure Manual should be used as a guide in laying out the structure prior to submission to the railway company for their approval. In general, horizontal clearance for the use of off track equipment should be provided on one side of the track.

Consult with the Roadway Design Unit when the vertical clearance does not meet the requirements as provided in the Structure Recommendations and the NCDOT Bridge Policy.

In fill sections, end bent slopes should be normal to the end bent cap, and in cut and partial cut sections, slopes should be normal to the railway ditch. The location of the toe of the slope should conform ~~with~~to the Federal Aid Policy Guide~~, Transmittal 1~~.

A minimum berm of 1 foot (300 mm) width normal to the end bent cap and 1'-6" (450 mm) above the bottom of the end bent cap shall be provided in front of the end bents.

Unless otherwise specified by the Railroad, slope protection shall be used for railroad overheads.

When slope protection is used, the berm shall be sloped away from and normal to the cap at a rate of ½ in/ft (50 mm/m). The proper berm width shall be used in determining the length of bridges. The berm widths shall be computed for both ends of both end bents. These berm widths and elevations shall be shown on the General Drawing and on the slope protection standard drawings.

In order to eliminate railroad shoring, drilled piers shall be used for the foundation of post and beam bents adjacent to railways.

Crashwalls should be considered in accordance with Section 7-10 of this manual.

11-5 Bridges on Horizontal Curve

The following information shall be included in the superstructure and approach slab drawings for horizontally curved bridges:

- Dimensions along the bent control line from the workline to each gutterline.
- Arc offset dimensions for the outside edge of superstructure for each span. These chord-to-arc ordinates shall be at 5 foot (1.5 m) intervals about the span's midpoint.
- Arc offset dimensions for longitudinal construction joints, if applicable.
- Short chord at the centerline survey for each span with the chord length and the intersection angle between the chord and the centerline of joint.

A long chord layout should be shown on the General Drawing. See Section 5-1 "Long Chord Layout" in this manual.

11-6 Pedestrian Bridges

Structures for pedestrian traffic shall meet the criteria set forth by the AASHTO Guide Specifications for Design of Pedestrian Bridges.

For submission of plans to FHWA where required, refer to the Policy and Procedure Manual.