

2.3.3 CLEARANCES

BRIDGES/CULVERTS OVER WATERWAYS OTHER THAN CANALS

For all closed bottom pipes with a clear span less than 12', the ratio of the headwater to diameter during Q25 flow should be equal to or less than 1.25. In addition, the Q100 flow must pass through the pipe without overtopping the roadway.

For all closed bottom rectangular structures with a clear span less than 12', the ratio of the headwater to height during Q50 flow should be equal to or less than 1.25. In addition, the Q100 flow must pass through the structure without overtopping the roadway.

All open bottom structures and all bridges/culverts with spans 12' and greater and less than 20' shall have a minimum 1' of clearance above Q50 flow. In addition, the Q100 flow must pass through the structure without overtopping the roadway.

All bridges/culverts with a clear span of 20' or greater shall have a minimum 2' clearance above Q50 flow. In addition, the Q100 flow must pass beneath the lowest chord of the structure.

BRIDGES/CULVERTS OVER CANALS

All structures over canals shall have a minimum of 1' clearance above the design flow and the maximum flow must pass beneath the lowest chord of the structure.

2.3.3.1 NAVIGATIONAL

Bridges over navigable waters shall meet the vertical clearances required by the Coast Guard.

2.3.3.2 HIGHWAY VERTICAL

All new bridges are to be designed for 17'-0" of vertical clearance. This clearance may be reduced with prior approval from the Roadway Design Engineer, Maintenance Engineer, and Bridge Engineer, but is not to be less than 16'-0".

During construction, as much vertical clearance as possible is desirable, with 14'-9" being the minimum desirable. The minimum legal vertical clearance is 14'-0". Check with the Permits Unit in Headquarters for restrictions for each particular site.

2.3.3.3 HIGHWAY HORIZONTAL

The structure width is generally controlled by the geometry of the approaching roadway. The required roadway widths are established in the *Roadway Design Manual*, Appendix C. Refer to sketches on page A2.6.

A. Bridges

The curb-curb width of new bridges shall be as follows:

No Sidewalk

Concrete Parapet:	roadway width + 3'-4"
Curb Mount Metal Rail:	roadway width + 4'-7½"

Sidewalk

Raised Sidewalk:	roadway width
At-grade Sidewalk:	roadway width + 3'-4"

B. Culverts

The curb-curb width of new culverts shall be as follows:

Clear Zone Provided

No Guardrail:	roadway width + clear zone
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Clear Zone Not Provided

W-Beam/Thrie Beam:	roadway width + 10'-0"
Concrete Porta-rail:	roadway width + 10'-8"
Concrete Parapet:	roadway width + 3'-4"

C. Construction

Horizontal clearances should be verified with the District Design Engineer, District Traffic Engineer, and the Bridge Engineer.

2.3.3.4 RAILROAD OVERPASS

For bridges carrying the railroad over the highway, the vertical clearances for highway crossings shall apply.

For bridges carrying highways over the railroad, the minimum vertical clearance shall be 23'-4" from the top of rail at a point directly over the centerline of track.

For exceptions, e.g. widening of existing structures, the railroad and PUC approvals should be obtained prior to final layout.

The UPRR and BNRR/SANTA FE standards on page A2.3 have not been approved by FHWA and are considered guidelines only. The dimensions shown as minimums on the standards should be considered as maximums for the purpose of determining span lengths. Exceptions to the standards that will reduce the bridge cost should be considered in the preliminary design stage of the project. Any exceptions to the standards must be approved by the railroad Chief Engineer and approval should be obtained prior to the final layout.

Some of the items where exceptions should be considered on a project-by-project basis are:

- Ditch width
- Location of the railroad pole line to eliminate or reduce the distance between the pier and the ditch slope.
- Elimination of splash boards
- Use of 1½:1 slopes on slope paving

Revisions:

April 2008

Added Coast Guard clearance requirement for bridges.

Modified waterway clearance requirements with the concurrence of the Hydraulics Engineer.

Added references to highway horizontal sketches in A2.6.

Changes culvert width for concrete porta-rail to roadway width + 10'-8".

Changed minimum railroad vertical clearance to 23'-4" to comply with BNSF/UPRR Guidelines for Railroad Grade Separation Projects, January 2007.

Added references to railroad drawings in A2.3.