

# Chapter 4

## Bridge Program Drawings

### Section 4.10-Bridge Railing

#### Introduction

Steel bridge railing and concrete bridge barrier rail are installed along the edge of the bridge roadway to keep errant vehicles within the bridge roadway and protect vehicle occupants and pedestrians.

#### Railing Types

**WYOMING TUBE-TYPE** bridge railing is a two structural tube configuration with posts comprised of two plates. Two types of Wyoming tube-type bridge railing can be used on projects. The standard, or most commonly used railing, is designated as **TL-3**. This railing uses two HSS 6 x 2 x ¼ for the longitudinal rail sections. The TL-3 railing can be used on all city, county, state, primary, and Interstate highways. The second railing type is designated as **TL-4**. This railing uses a HSS 6 x 4 x ¼ and a HSS 6 x 3 x ¼ as the longitudinal rail sections. The TL-4 also incorporates a thicker plate for the post than the TL-3 railing. The TL-4 railing should be used on new construction, widenings, and rehabilitations (where the post anchorage can be placed in the deck) on Interstate 80, Interstate 25 between Cheyenne and the Colorado State line, urban areas, and at other locations where the truck volumes are a large percentage of the traffic.

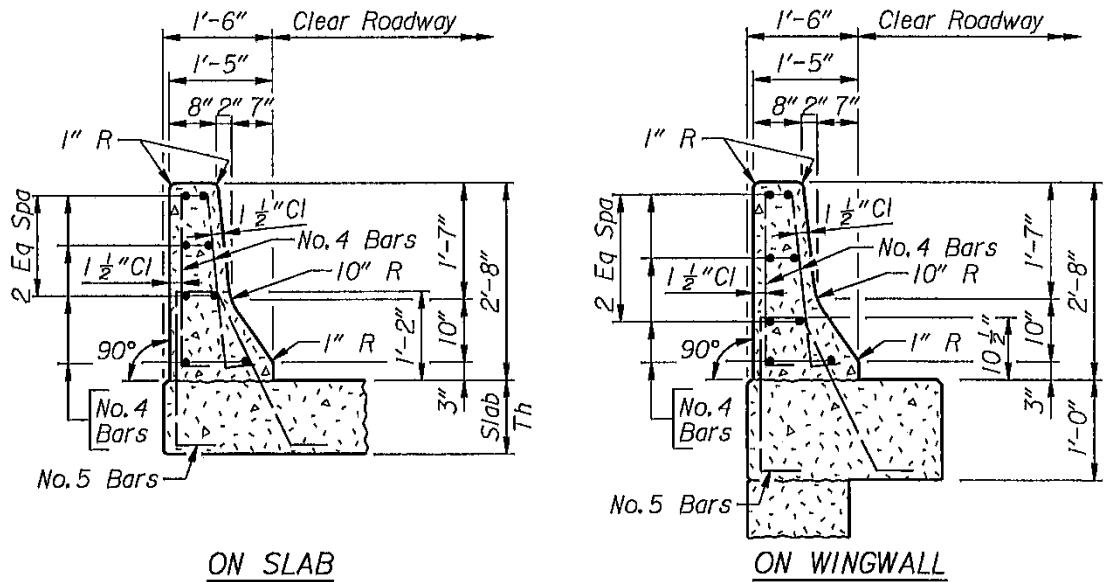
On new construction, the top rail is 2'-5" or 2'-8<sup>5</sup>/<sub>8</sub>" above the deck with posts mounted on 6" thick curbs or sidewalks for the TL-3 and TL-4 railings respectively. The following table lists the maximum and minimum top rail height above the wearing surface for rehabilitations. The table is based on a minimum curb height of 4" and a maximum of 9".

Railing	Top Rail Height Above Wearing Surface	
	Minimum	Maximum
TL-3	2'-3"	2'-8"
TL-4	2'-6 <sup>5</sup> / <sub>8</sub> "	2'-11 <sup>5</sup> / <sub>8</sub> "

Both the TL-3 and TL-4 railing are FHWA crash tested. Any modifications to the railing, post, post base plate, or anchorages must be approved by the State Bridge Engineer.

Splash boards on bridges over railroads will be used only when requested by the railroad and approved by the State Bridge Engineer.

Concrete **BRIDGE BARRIER RAIL** (New Jersey Barrier Rail) is a standard reinforced concrete barrier detailed on the Slab Details, Approach Slab Details, and any relevant Abutment Details. Bridge Barrier Rail Transition Details are to be used for the connection to the approach railing.



## Terminal Types

The following terminal types will be used based on the approach railing the Project Development Program provides in conjunction with the Engineer's Recommendations.

**TERMINAL TYPE 1** connects bridge railing to an upper HSS 6 x 6 x  $\frac{3}{16}$  rail and a lower HSS 6 x 2 x  $\frac{1}{4}$  rub-rail box beam approach railing combination. This terminal type may be used at entrance ends of interstate bridges or all four corners (usually) of primary and secondary bridges.

**TERMINAL TYPE 2** connects bridge railing to a HSS 6 x 6 x  $\frac{3}{16}$  or a HSS 8 x 6 x  $\frac{1}{4}$  box beam approach railing. This terminal type is used only on exit ends of Interstate bridges when box beam guardrail is connecting the bridge railing.

**TERMINAL TYPE 3** connects bridge railing to corrugated beam approach railing or is used when no end connection is required. This terminal type may be used on secondary, county, and urban

bridges, and on Interstate bridges where traffic cross-overs and no permanent approach railing are required.

**TERMINAL TYPE 4** shall be used when railing turn-down terminates on the bridge or approach slabs. This terminal type should only be used when the design speed is less than 35 mph.

**TERMINAL TYPE 5** shall be utilized when railing turn-down terminates off the bridge or approach slabs. This terminal type should only be used when the design speed is less than 35 mph.

When a railing turn-down terminates on bridge or approach slab, modification of concrete depth and/or reinforcing steel location may be required.

## Rail Splices

**EXPANSION SPLICES** refer to the expansion joints placed in the railing, in the span between railing posts, that crosses over the bridge expansion joints. The standard expansion splice is designed to take up to 2<sup>3</sup>/<sub>4</sub>" movement in each direction. The engineer must check the adequacy of this splice to handle required movement.

**STANDARD SPLICES** are designed to take up to 1/2" movement in each direction, but are not to be used as expansion splices.

**DOUBLE BOLTED SPLICES** are used when an individual rail is not continuous over a minimum of two posts.

## General Design and Detail Information

Post locations for tube-type railing are governed by a **MAXIMUM AND MINIMUM POST SPACING**, the location of expansion devices and curb/sidewalk **CONTRACTION JOINTS**, and the **MINIMUM CONCRETE COVER** to post anchorages.

Maximum Post Spacing: 9'-3"

(Use 1" increments for post spacing when possible.)

Minimum Post Spacing: 7'-0"

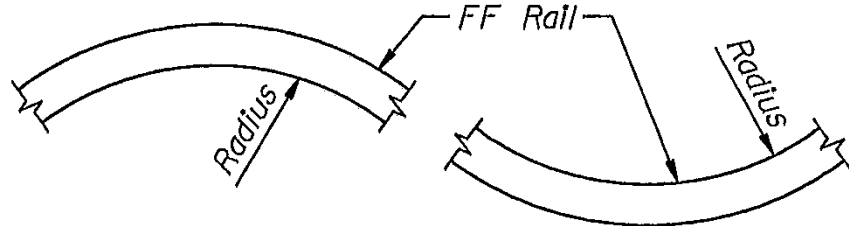
Minimum Concrete Cover at end of slab and approach slab, cold joints, and expansion joints: 6" (This is not applicable at curb/sidewalk contraction joints on bridges with continuous decks.)

The anchor bolt length will need to be verified for approach slabs with asphalt overlays.

**RAILING POST BASE PLATES** must lie flat against concrete

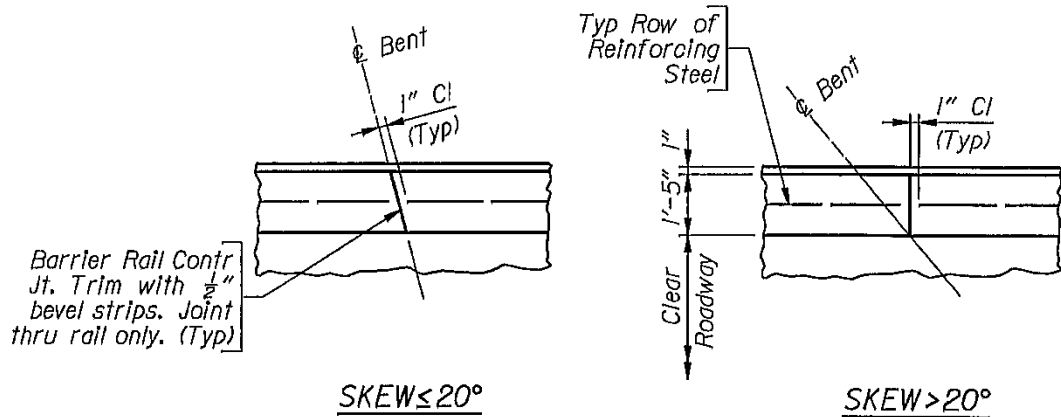
over the entire length. Base plates may not have any portion of the plate extend onto or lie across curb/sidewalk contraction joints.

On curved bridge decks, the bridge railing lengths shall be shown along the front face of the railing. Radius to the railing shall be shown to the inside of the curve.



**TERMINAL CANTILEVER** past the centerline of end post for Terminal Types I through 3 shall be 2'-0" for all Wyoming tube-type railing. Distance from end post to end of curb/sidewalk is recommended to be 2'-0", minor variations up to 3" will be acceptable.

Bridge barrier rail shall be made continuous, except for locations at bridge deck expansion joints, bents, and piers. At expansion joints, the railing shall match the end of the front face of abutment and/or the ends of the concrete deck. At bents and piers, a barrier rail **CONTRACTION JOINT** shall be used as shown below.



For spans greater than or equal to 50', contraction joints shall be provided for shrinkage and shall be spaced at 25'-0" maximum. Reinforcing steel will be continuous through these joints

## Standard Sheets

Name	Description
TL3_BR1	Wyoming tube-type TL-3 bridge railing. Details of post on curb/sidewalk, anchorage, rail bolt, and sleeves. Bridge railing plan to be drawn on this sheet.
TL3_BR2	Wyoming tube-type TL-3 bridge railing. Details of Terminal Types 1 through 3 and splices.
TL3_BR3	Wyoming tube-type TL-3 bridge railing using turn-down Terminal Type 4. Details of terminal, end anchorage, and splices.
TL3_BR4	Wyoming tube-type TL-3 bridge railing utilizing turn-down Terminal Type 5. Details of terminal, end anchorage, splices, and Bill of Reinforcement.
TL4_BR1	Wyoming tube-type TL-4 bridge railing. Details of post on curb/sidewalk, anchorage, and rail bolt. Bridge railing plan to be drawn on this sheet.
TL4_BR2	Wyoming tube-type TL-4 bridge railing. Details of Terminal Types 1 through 3.
TL4_BR3	Wyoming tube-type TL-4 bridge railing. Details of splices.

## Cells

Name	Description
BOLTRP	Rail Mod Repair Bolt
WBL1A	Railing Weld AWS B-L1a