# **13.4 BRIDGE RAILINGS - GENERAL**

All bridge railing on the State Highway System and Local/Off System routes shall conform to MASH criteria. Bridge traffic railing at the edge of deck on Interstate and 4 lane highways shall conform to at least TL-4 requirements and shall be at least 42" tall. Bridge railing at the edge of deck on all other bridges on the State Highway System shall conform to at least TL-3 requirements and shall be 42" tall (see commentary). This includes all overpass bridges that are over State or Interstate highways. Bridge railing not in the Bridge Design Manual may be used on Local/Off System bridges if the railing meets the MASH criteria and test level requirements of Article 13.7.2 in the AASHTO LRFD Bridge Design Specifications.

Median barriers shall conform to at least MASH TL-3 requirements and shall be at least 32" tall.

One of the standard rail types as shown in the Bridge Design Manual Standard Drawings shall be shown on the plans, unless there is a clearly provable advantage in doing otherwise. Among those types, selection shall be made with due consideration of economy, aesthetics, Level of Service, and the preference of the District Engineer. The following table indicates the test level of ITD standard railings. Test Levels are defined in the AASHTO LRFD Bridge Design Specifications Article 13.7.2.

Pridge Poiling at Edge of Deek	MASH
Bridge Raining at Edge of Deck	Test Level
42" Single Slope Concrete Parapet	TL-4*
42" Combination Rail	TL-4
42" Three Tube Curb Mount Rail	TL-4
42" Single Slope Median Barrier	TL-4

# STATE HIGHWAY SYSTEM & LOCAL/OFF SYSTEM

\*See commentary

### **NEW CONSTRUCTION**

Concrete parapet is the preferred rail type for safety reasons. When an overlay is placed on the structure during original construction, the height of the rail should be from the top of the overlay. The height of the 42" Single Slope Concrete Parapet does not need to be raised if the depth of overlay is less than 6". Other rail types should be considered to meet Context Sensitive Design criteria.

Concrete parapets and median barriers shall be constructed perpendicular to the roadway cross slope for superelevation rates up to 6%. Bridges with superelevation rates greater than 6% shall be evaluated on a case-by-case basis.

For superelevation rates greater than 6%, revise the Notes on the Standard Drawing as follows:

- Concrete parapet shall be constructed so that the outside face is in a vertical plane. Height control shall be at the inside (traffic) face. End faces that fit up to precast concrete end sections shall be constructed perpendicular to the roadway grade.
- Concrete median barrier shall be constructed vertically.

Combination railings shall be used on a raised sidewalk when there is no barrier between the roadway and sidewalk. The Three Tube Curb Mount Rail also meets the criteria for a combination railing.

Combination railing with a protective pedestrian fence shall be used on sidewalks on bridges over highways. The protective pedestrian fence is only needed where there is a sidewalk or dedicated bicycle lane. Refer to page B13.3C for details of railing. Fencing requirements for bridges over railroads shall follow the BNSF-UPRR Guidelines for Railroad Grade Separation Projects Overhead Structure Barriers and Fences details.

Pedestrian/Bicycle Railing shall be used when a traffic barrier separates the roadway from the sidewalk.

W-Beam railing may be used if the site meets TL-3 criteria and the span length is less than 40'.

#### **REHABILITATION**

The following bridge rail options should be considered on a deck rehab project:

#### **DO NOTHING**

When no deck replacement or bridge widening is being done on the bridge and the existing rail is in good condition and designed in accordance with the AASHTO Standard Specifications for Highway Bridges, then the existing rail is acceptable. The railing does not require a successful crash test, but the connection to the roadway railing should be modified to meet current standards.

If the railing is in good condition and the work done on the bridge does not impact the railing, the railing does not need to meet MASH criteria.

### **UP-GRADE**

Up-grade the existing rail to MASH criteria when the deck slab is replaced. One of the standard rail types shown in the Bridge Design Manual should be used. The deck slab and exterior girder shall meet the requirements of the current AASHTO code.

#### TEMPORARY BARRIERS

Unpinned concrete barriers following the details of standard drawing 612-18 may be used if there is at least 2'-0" of clearance from the back of the barrier to the edge of deck.

Concrete barriers not meeting the requirements for an unpinned barrier shall be pinned. There are no known MASH crash-tested pinned barrier details at this time. The pinned barrier details on BDM B13.9 were designed for TL-4 according to the procedures in Appendix A13.

#### Commentary:

All projects with a bid letting date after December 31, 2019 shall conform to MASH criteria to conform to the January 2016 AASHTO/FHWA Joint Implementation Agreement and the August 24, 2017 memo from Kevin Sablan, ITD Design/Traffic Services Engineer.

The 42" single slope parapet meets TL-5 MASH criteria. The parapet was analyzed according to AASHTO Article A13.4 for TL-4 loads to insure the parapet would yield before the cantilever deck. An 8" cantilever deck with a top mat of transverse #5 bars (a) 12" and 2-#6 bundled bars at 12" between the #5 bars (As = 1.19) would provide the moment capacity greater than the parapet for a TL-4 loading.

Although AASHTO is the code that governs bridge design, OSHA regulations govern safety and health regulations for construction activities. The OSHA regulations in 29 CFR 29B Chapter XVII Part 1926 Subpart M 1926.502 state that employers shall provide guardrail systems that are at least 42 inches tall for employees. ITD has decided to provide bridge rail at the edge of deck that is 42 inches tall on the state highway system, regardless of the test level required by AASHTO to ensure that future work on the bridge will not require temporary rail or require workers to tie off to meet this OSHA requirement.

# **Crash Test Reports**

STATE	HIGHWAY	SYSTEM	&	LOCAL/ OFF SYSTEM
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RAIL TYPE	REPORT	MASH TEST LEVEL
42" Single Slope Concrete Parapet	MASH Equivalency of NCHRP Report	MASH Equivalency of NCHRP Report
	350-Approved Bridge Railings	350-Approved Bridge Railings
	NCHRP20-07/Task 395	Table 7.1 NCHRP350 TL5 equals
	TTI Project 607141	MASH TL5
	November 2017	
42" Combination Rail	Texas A&M Transportation Institute	TL-4
	Report 0-6946-R2	
	March 2019	
42" Three Tube Curb Mount Rail	Texas A&M Transportation Institute	TL-4
	Report 612711-01	
	February 2020	
42" Single Slope Median Barrier	Texas A&M Transportation Institute	TL-4
	Report 0-6946-1	
	January 2018	

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# **Revisions:**

June 2006	The Combination Rail Test Level was changed to TL-3 to comply with Article 13.7.3.2. Corrected the w-beam railing reference from PL-1 to TL-3. Added the Delaware Retrofit to the Retrofit options. Added reference for Context Sensitive Design rail options. Added reference to new rail retrofit standard drawings B13.7A – B13.7E.
Oct 2017	Added criteria for using protective pedestrian fence.
July 2018	Added MASH test levels for each rail type. Clarified the rail height when an overlay is placed during new construction. Clarified the need to upgrade the rail to MASH criteria during rehabilitation work. Added ITD policy for the minimum test levels required. Added Commentary for using TL-4 for a 42" single slope concrete parapet and Oregon Three Tube Curb Mount Rail. Added commentary on OSHA rail height requirements.
May 2021	Added Tables for applicable railing for use on State or Local/Off System highways. Added Crash Test Report Tables.
June 2022	Added railing at edge of deck shall be 42" tall. Added criteria for Local/Off System bridge railing. Added Median barriers shall be at least TL-3 and 32" tall.
Oct 2023	Added criteria for temporary barriers. Deleted 32" jersey parapet, 32" 2-tube curb mounted rail, and 32" median barrier.