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Memo

Date: 2/3/2020

To: Bridge Design Engineers

From: Arielle Ehrlich
State Bridge Design Engineer

RE: Memo to Designers #2020-01: MASH Implementation and Bridge Railing Design

Introduction

This guidance supersedes the guidance given in Memos to Designers #2016-01 and #2017-01. With the release of this memo, Memos to Designers #2016-01 and #2017-01 are officially rescinded.

This Memo to Designers incorporates all of the recent changes to bridge railings as of the date of publication. AASHTO has plans to rewrite Section 13 of the *AASHTO LRFD Bridge Design Specifications* (LRFD). Section 13 of MnDOT's *LRFD Bridge Design Manual* (BDM) will receive a full update once the LRFD Section 13 rewrite is complete. At that time, the information in this Memo to Designers will be incorporated into the BDM.

MASH Implementation

In order to explain MnDOT's plan for meeting the Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO) schedule for the implementation of the *Manual for Assessing Safety Hardware* (MASH), MnDOT has developed a *MASH Implementation Plan for Bridges*. That document is available under the "Guidance" section at: http://www.dot.state.mn.us/bridge/design.html. It details the types of bridge railings that are acceptable for both new installations and for retrofits. Note that the MASH Implementation Plan for Bridges will change as bridge railings are crash tested and guardrail connection details and end post details are finalized. Therefore, revisit the link for updates when starting a new bridge project

and when finalizing the bridge plan. Standards for bridge railings are found in the Bridge Details Manual Part II, which are available at: https://www.dot.state.mn.us/bridge/bridgedetails2.html.

Detailing Requirements

For bridges where a TL-5 barrier would currently be recommended due to high design speeds, curvature, truck traffic, or other site considerations (see BDM Article 13.2.1), use a TL-4 42" tall Type S barrier or TL-4 54" tall Type S barrier where a glare screen is needed.

For bridges with wingwall orientation parallel to the roadway that have a Type S barrier located on top of the wingwalls, detail the wingwalls to be the same thickness as the barrier (1'-4") for the top 1'-6" and then transition to the full standard thickness. See Figure 1.

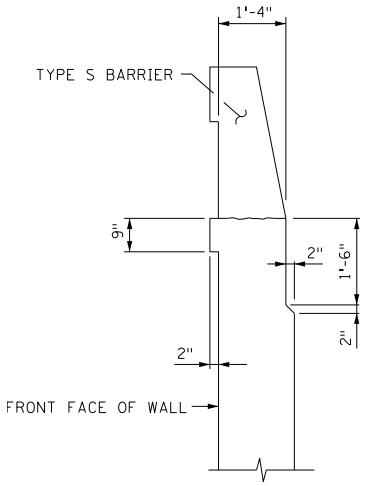

Figure 1

The Midwest Roadside Safety Facility (MwRSF) has provided recommendations for bridge traffic railing placement that are dependent on the cross slope. MwRSF recommends limiting the angle between the roadway surface and the vertical axis of the traffic railing to a maximum of 90 degrees. Use the following guidance to meet these recommendations:

- For driving surfaces with a normal crown section, detail the traffic railing as plumb. See Figure 2 below.

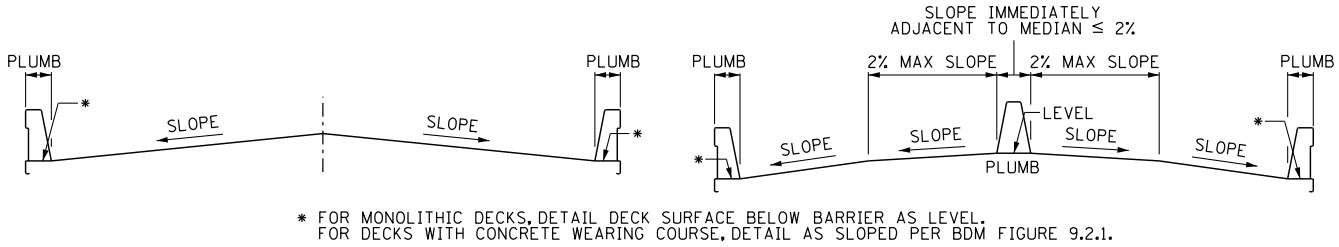

Figure 2 – Crown Section

- For driving surfaces with a <u>constant</u> cross slope (superelevated roadway), detail the angle between the bridge deck/roadway and the vertical axis of the traffic railing so it does not exceed 90 degrees. See Figure 3 below.

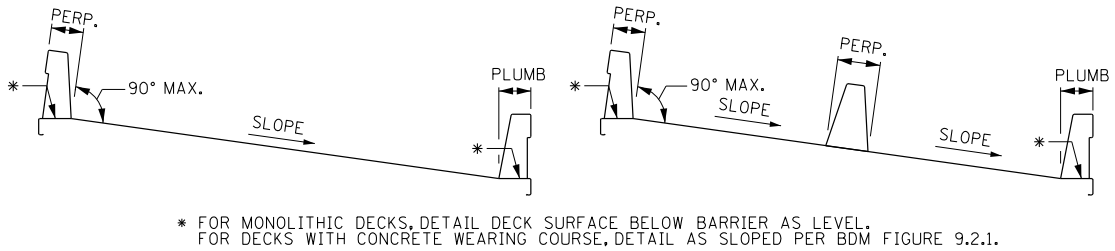

Figure 3 – Constant Cross Slope

- For bridge decks with a variable cross slope or superelevation, detail the angle between the bridge deck/roadway and the vertical axis of the traffic railing to transition from plumb to perpendicular (or vice versa) as shown in Figure 4. In this example, the cross section changes from a crown section to a superelevated cross slope, so the left barrier transitions from plumb at the crown section to perpendicular at 0% slope.

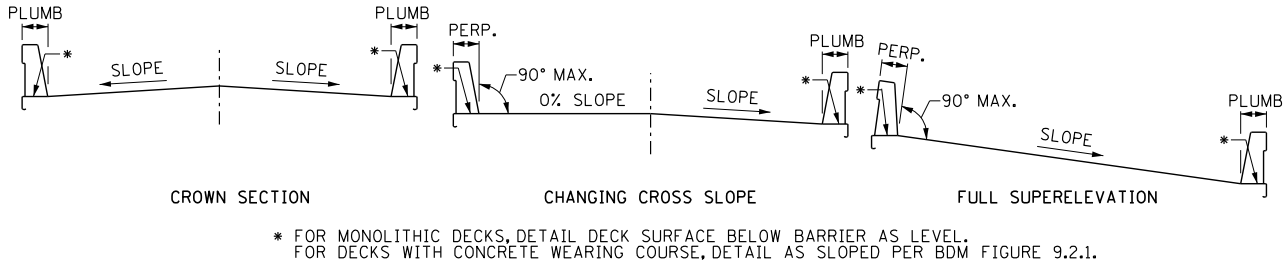

Figure 4 – Variable Cross Slope

- As indicated by the examples above, the vertical position of the traffic railing axis varies depending on the adjacent driving surface slope; therefore, it is imperative that the bridge and roadway designer work together to ensure that design plans are coordinated and that the detailing on the bridge plan matches the roadway plan and vice versa. Consideration of the traffic railing axis must also be taken into account when the barrier/parapet is mounted on top of a wall or approach panel.

- Where fully superelevated cross slopes exceed 2%, include traffic railing height dimensions for both the front <u>and</u> back face of barriers/parapets located at the top of the slope. In addition, revise the R501E, R502E, and R503E bars to provide a minimum front leg projection of 10 inches.