

TO: All Design Section Staff
FROM: Bijan Khaleghi
DATE: April 18th, 2022
SUBJECT: WSDOT Barrier Test Level Modifications

This design memorandum provides revisions to the WSDOT Barrier Test Levels and provides clarifying language for the intent and use of the Pedestrian Barrier. These changes are a result of WSDOT's internal policy for determination of crashworthiness of roadside safety hardware specifically as it relates to using barriers having adequate height to contain the crash test vehicle(s) to AASHTO Manual for Assessing Safety Hardware (MASH) standards.

Bridge Design Manual Revisions

The following sections of the WSDOT Bridge Design Manual are revised as follows:

Revise Section 10.2.3 C with:

C. Traffic Barrier – 32" F-Shape (~~TL-4~~ TL-3)

Revise Section 10.2.3 D with:

D. Traffic Barrier – 34" Single Slope (~~TL-4~~ TL-3)

Replace Section 10.2.3 E with:

E. Pedestrian Barrier (~~TL-4~~ TL-3)

This crash tested rail system offers a simple to build concrete alternative to the New Jersey and F-Shape configurations. This system was crash tested under both NCHRP 230 and 350. Since the traffic face geometry is better for pedestrians and bicyclists, WSDOT uses this system primarily in conjunction with a sidewalk. This barrier height will require the use of a Bridge Railing Type Pedestrian railing to meet fall protection requirements.

The Pedestrian Barrier has been reduced from a TL-4 barrier to a TL-3 barrier due to its height of 34” being less than adequate to contain the design vehicle when compared to MASH criteria. The intent is to design this barrier as a TL-4 barrier, even though its classification does not meet TL-4 due to the height. On projects which have a minimum of 5’ of raised sidewalk from the barrier face to traffic or a TL-4 barrier protecting the Pedestrian Barrier from traffic, it is permissible to use this barrier for new construction as a TL-3. For instances absent a TL-4 barrier or sidewalk as described, a unique barrier design with an overall height of 36” is required to meet the TL-4 criteria.

For complete details, see [Bridge Standard Drawing 10.2-A4](#).

Background

The WSDOT has an internal procedure to determine the crashworthiness of roadside safety hardware following the AASHTO/FHWA Joint Implementation Agreement for the AASHTO Manual for Assessing Safety Hardware (MASH). One aspect in determining the crashworthiness for rigid barriers is having adequate height to contain the crash tested vehicle. From published results of MASH crash testing, the minimum rail heights of 29”, 36”, and 42” correspond to MASH TL-3, TL-4, and TL-5 respectively. These values are reported in the Project No. 20-07/Task 395 TTI Project 607141, “Mash Equivalency of NCHRP Report 350-Approved Railings”, November 2017. Further, the 36” barrier height metric for TL-4 barriers is included in the TTI Test Report No. 9-1002-5, “Determination of minimum height and lateral design load for MASH test level 4 bridge rails”, December 2011. Since the three barriers modified by this document all have heights less than 36” they are deemed to be not appropriate for TL-4 use per the WSDOT's internal procedure for determination of crashworthiness of roadside safety hardware.

The 32” F-shape and the 34” single-slope barriers are not intended for new construction, thus the reduction in test level classification from TL-4 to TL-3 should not adversely affect their use. They are found to be crashworthy for MASH TL-3 based upon their height greater than 29” along with past comparisons to similar crash tested barriers.

The Pedestrian Barrier is intended for new construction. It is the bridge office’s intent to keep designing this barrier using TL-4 criteria even though the barrier is classified as a TL-3 due to the less than 36” height. The connection to the deck and the strength and stability calculations for moment slabs will still use TL-4 loadings per the Bridge Design Manual (BDM). The current requirements for designing to a TL-4 loading under Standard Specifications 6-13.3(2)A remain unchanged. The new use statement in the BDM 10.2.3(E) update provides clarity in relation to BDM 10.2.1 requirement “...to design traffic barriers for new structures using a minimum Test Level 4 (TL-4)”. The intent is to allow the TL-3 Pedestrian Barrier, designed to TL-4 loadings, for use on new construction when the provided metrics are met while

requiring a unique Pedestrian Barrier design when the sidewalk or TL-4 barrier is not present to the given requirements.

Future consideration will be given to the Pedestrian Barrier to either raise the height to 36" to comply with TL-4 crashworthiness or to broaden the allowed use for this type of barrier as TL-3.

Contact Information

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