**DATE: October 9, 2015**



Project Development Branch

Standards and Specifications Unit

Memorandum

**TO: Josh Laipply, Chief Engineer**

**FROM: Scott McDaniel, Director of Project Support**

**Project Development Branch**

**SUBJECT: MASH tested 31-inch Guardrail Implementation Policy**

The Project Development Branch is in the process of revising the Standard Drawings and Specifications to begin the implementation to the new Manual for Assessing Safety Hardware (MASH) testing as requested and highly recommended by the Federal Highways Administration (FHWA). The Standards and Specifications unit is particularly focusing on updating the details and specifications to what will replace the current Standard Plan M-606-1 *Guardrail Type 3 W-Beam,* 28” high guardrail system to the new M*-606-1 Midwest Guardrail System Type 3 W-Beam (31”)* with plans to make it effective by December 31, 2015. Therefore, in consideration of how this will affect the projects the Standards and Specifications unit proposes implementation of the following policies in conjunction with the FHWA proposed schedule.

The new 31” high Midwest Guardrail System (MGS) details use the generic, non-proprietary Midwest Guardrail System (MGS), which meet the recently released AASHTO MASH testing requirements for 31” guardrail. The major changes from the current guardrail standard detail are:

* raise the height of guardrail from 28” to 31”,
* offset blocks are changed from 8” wide to 12” wide,
* change the guardrail splice locations from the guardrail posts to the center of the guardrail post spacing at the end of each of the W-Beam panels;
* and, use an asymmetric versus symmetric transition to the concrete barriers and bridge rail.
* It is important to note that the costs of the new system are the about same as the old rail, but the 31” MGS provides better performance.

The current M-606-1 *Guardrail Type 3 W-Beam,* 28” high guardrail system only meets the NCHRP Report 350 Test Level 3 criteria for 27¾” high guardrail. A deadline for using only the 31” high MASH tested rail on highway projects has been set for December 31, 2017 (FHWA is recommending implementation as soon as possible); and therefore, it is CDOT’s intention to begin this implementation, for all projects with new rail, on December 31, 2015. The following are factors that each region should consider for either raising or replacing existing rail on new projects:

* If the existing rail is not to be relocated or modified and the height of the rail is 26.5” or higher it may remain in place. Obviously, the region may replace the existing rail if it believes that it would be prudent to do so in conjunction with the new project (i.e. the rail is in poor condition, safety assessment demonstrates the need, or new upcoming projects will require replacement).
* If the existing rail height is less than 26.5” then the entire rail must be raised or replaced (this is an FHWA requirement). Options to raise or replace existing rails that do not meet the 26.5” requirement are as follows:
  1. Use higher additional bolt hole provided in the post to raise the rail to 26.5” or higher and then it may remain in the existing configuration (currently this cost to “Modify Guardrail – 210-0435 is approximately $8/ft.).
  2. Use the existing steel (W-Beam rail) and posts (if the majority are in good condition they may be utilized in raising the rail to 31-inches). The blocks must be replaced with the new 12” blocks, the posts raised/reset, and the splices (with backing plate) must be mid-span between the posts rather than on the posts (thus additional bolts are required and new bolt holes drilled into the existing steel beam may be required). This would likely raise the cost of “Modify Guardrail to 31-inch MGS” to approximately $15 to $18/ft.
  3. Remove existing rail and install new 31” MGS rail as detailed. Currently the cost to remove existing rail is approximately $5/ft. and the cost to set new rail is approximately $18/ft.; and therefore, since this cost will remain pretty consistent for the new 31” MGS rail, the overall cost for removing and installing new will be approximately $23/ft.
     + Note that for options 2 and 3, all the end anchorages/sections and the bridge transitions must be replaced as shown on the Project Special/Standard Detail.
     + Also for options 2 and 3, if new 12” blocks cause an issue with the alignment, then the “no block” version of the 31” MGS rail may be allowed.

Other safety devices associated with the guardrail will follow the FHWA guidelines, regarding the switch to MASH tested devices, as follows:

* + December 31, 2017: cast-in-place concrete barriers
  + June 30, 2018: w-beam terminals
  + December 31, 2018: cable barriers, cable barrier terminals, and crash cushions
  + December 31, 2019: bridge rails, transitions, all other longitudinal barriers (including portable barriers installed permanently), all other terminals, sign supports, and all other breakaway hardware

Additional consideration should be given to CDOT’s maintenance of existing rail that is damaged, alternatives that should be considered are:

1. If more than 50% of an existing run of rail 200 feet in length or less, or 70% of and existing run of rail 210 feet in length or longer is damaged or in poor condition, then the entire rail should be replaced with the new 31” MGS rail. If short sections (50 feet or less) tied into a bridge or an end anchorage that are damaged or if the end anchorage itself is damaged, they should be replaced with the new 31” MGS rail. All the end anchorages/sections and the bridge transitions must be replaced as shown on the Project Special/Standard Detail. Therefore, if the existing rails are under these thresholds, they may be replaced at the existing height (unless the existing height is 26.5” or less then see alternative II below) and configuration.
2. If the existing rail height is less than 26.5” then the entire rail should be raised or replaced based upon one of the following options:
   1. If the existing rail can be raised to 26.5” or higher using the additional bolt hole provided in the post, then the rail will not be required to be replaced, it may remain in the existing configuration, but must be raised to 26.5” or higher.
   2. If the existing rail can be raised to 28” or higher using by raising the posts, then the rail will not be required to be replaced, it may remain in the existing configuration, but must be raised to the current standard of 28” or higher.
   3. If the existing steel (W-Beam rail) and posts are in good condition they may be utilized in raising the rail to 31-inches. The blocks must be replaced with the new 12” blocks, the posts raised/reset, and the splices (with backing plate) must be mid-span between the posts rather than on the posts (thus additional bolts are required and new bolt holes drilled into the existing steel beam may be required). All the end anchorages/sections and the bridge transitions must be replaced as shown on the Project Special/Standard Detail.

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