0-6990: Development of MASH Test Level 3 (TL-3) Compliant Transition between Median Guardrail and Median Concrete Barrier

Background
The Texas Department of Transportation (TxDOT) is in the process of implementing roadside safety hardware on Texas highways in compliance with the American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (MASH). The focus is to further enhance safety on Texas highways. TxDOT currently has a MASH Test Level 3 (TL-3) compliant double-faced guardrail in use. However, this system needs end termination or connectivity adapters to other barriers. The connectivity between the median guardrail and the median concrete barrier is the transition section. There is a safety need to develop a MASH-compliant transition between the double-faced median guardrail and the median concrete barrier.

What the Researchers Did
In this study, the Texas A&M Transportation Institute addressed key performance issues, such as vehicular redirection, vehicular stability, and vehicular pocketing into the transition section, to create a design for a successful MASH transition section between a double-faced median guardrail and a median concrete barrier. The purpose was to develop a MASH TL-3 compliant transition between the median guardrail and median concrete barrier, and then test the design according to MASH crash testing guidelines.

Finite element computer simulations were used to aid in the design of the median transition. Full-scale crash testing was completed to assess the safety performance of the double-faced W-beam median barrier transition to the concrete parapet according to the safety-performance evaluation guidelines included in MASH for TL-3. Data obtained from the crash tests were analyzed, and the results were used to guide the project conclusions and recommendations. Additionally, implementation guidance for the new transition system was created.

Multiple tasks were included in this research project. A literature review, computer simulations, and full-scale crash testing were performed to accomplish the project objectives.

What They Found
After computer simulations showed a reasonable chance of the transition passing MASH Test 3-21 with a RAM pickup truck model, full-scale crash testing was initiated to evaluate the transition design experimentally.

Due to rollover of the pickup truck, the initial design failed to redirect the vehicle in a safe and stable manner. To improve the performance of the transition system, the researchers made several modifications. First, the lower W-beam rail was attached to the end face of the concrete parapet with a steel bracket. This was done by moving the lower W-beam rail toward the post line via reducing the side of the wood blocks. Second, an extra post was added upstream of the quarter spacing region to...
smooth the stiffness of the transition between the half-spaced posts and the quarter-spaced posts. Third, a vertical taper was added to the end of the concrete barrier parapet.

Four tests were performed on this modified design, and the transition performed successfully according to MASH TL-3 specifications for transitions.

**What This Means**

The new TxDOT median guardrail transition to a concrete parapet has been evaluated through full-scale crash testing per MASH TL-3 conditions. Figures 1 and 2 provide general details of this transition. This system is ready for implementation as a transition between a crashworthy median W-beam guardrail and a MASH TL-3 crashworthy median concrete barrier while maintaining the connectivity details tested in this research effort.

For More Information

**Project Manager:**
Wade Odell, TxDOT, (512) 416-4737

**Research Supervisor:**
Akram Y. Abu-Odeh, TTI, (979) 317-2682

Technical reports when published are available at [http://library.ctr.utexas.edu](http://library.ctr.utexas.edu)

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov
Keyword: Research

This research was performed in cooperation with the Texas Department of Transportation and the Federal Highway Administration. The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented here. The contents do not necessarily reflect the official view or policies of FHWA or TxDOT. This report does not constitute a standard, specification, or regulation, nor is it intended for construction, bidding, or permit purposes. Trade names were used solely for information and not for product endorsement.