

## 0-6968: Roadside Safety Device Analysis, Testing, and Evaluation Program

### Background

Roadway departure crashes represent approximately 50 percent of fatalities on Texas roadways each year. Roadside safety devices shield motorists from roadside hazards such as non-traversable terrain and fixed objects, thereby reducing injuries and fatalities associated with roadway departure crashes. Development of new or improved roadside safety devices that accommodate a variety of site conditions, placement locations, and a changing vehicle fleet can further enhance the safety of the motoring public. Under this project, issues related to roadside safety devices that were a high priority to the Texas Department of Transportation (TxDOT) were addressed.

### What the Researchers Did

Roadside safety issues prioritized by the TxDOT Bridge, Design, Maintenance, and Traffic Safety Divisions were evaluated. Devices of interest included guardrail, bridge rails, median barriers, transitions, terminals, breakaway structures (sign supports and mailboxes), portable barriers, and work zone traffic control devices. An appropriate research plan was developed and executed for each prioritized research task. Depending on the nature of the research task, the evaluation included engineering analyses, computer simulation, dynamic impact testing, and full-scale vehicular crash testing (e.g., Figure 1), as appropriate. Crash testing was performed in accordance with the second edition of the American Association of State Highway and Transportation Officials *Manual for Assessing Safety Hardware (MASH)*.



**Figure 1. Concrete Barrier-Mounted Containment System for Motorcycle Riders.**

*MASH* provides comprehensive procedures for the safety performance evaluation of roadside safety hardware. For each device evaluated, factors such as occupant risk, vehicle stability, maintenance, and cost were considered.

#### **Research Performed by:**

Texas A&M Transportation Institute

#### **Research Supervisor:**

Roger P. Bligh, TTI

#### **Researchers:**

Akram Abu-Odeh, TTI

Sofokli Cakalli, TTI

James Kovar, TTI

Sana Moran, TTI

Nathan Schulz, TTI

Nauman M. Sheikh, TTI

Chiara Silvestri Dobrovolny, TTI

William F. Williams, TTI

A Rum Han, TTI

Sun Hee Park, TTI

#### **Project Completed:**

10-30-2020

## What They Found

Table 1 summarizes the specific devices evaluated and the results of the evaluations. The table indicates the *MASH* test level for which impact performance was assessed and if the device is considered to be *MASH* compliant. Details of the evaluation of each device are addressed in a separate research report or technical memorandum.

## What This Means

This project evaluated prioritized roadside safety issues and resulted in numerous new or improved roadside safety devices. Devices found to be *MASH* compliant are suitable for implementation. Implementation of these roadside safety devices will improve motorist safety, reduce material and installation costs, and/or improve operations. These devices are being implemented through development of new or revised standard detail sheets. Further research is recommended for devices that failed to meet *MASH* requirements.

**Table 1. Summary of Research Results.**

| Roadside Safety Device  | MASH Compliant | Test Level      |
|---|----------------|-----------------|
| <b>Bridge Rail</b>  |                |                 |
| Shallow Anchorage Options for Single-Slope Concrete Barrier                       | Yes            | TL-4            |
| Retrofit Bridge Rails on Curbs  | Yes            | TL-4            |
| Load Response of a Cast-in-Place Retaining Wall to a TL-4 Bridge Rail Impact      | Yes            | TL-4            |
| Performance of Existing TL-4 Bridge Rails under MASH TL-5 Impact Conditions       | Not applicable | TL-5            |
| <b>Guardrail</b>  |                |                 |
| Modified Round Post Guardrail   | Yes            | TL-3            |
| Modified Round Post Guardrail in Concrete Mow Strip                               | Yes            | TL-3            |
| Modified Round Wood Post Guardrail in Rocky Terrain                               | No             | TL-3            |
| <b>Portable Concrete Barrier</b>  |                |                 |
| TL-3 Low-Profile Barrier  | Yes            | TL-3            |
| Free-Standing Single-Slope Concrete Barrier with Modified Cross-Bolt Connection   | Yes            | TL-4            |
| <b>Breakaway Support Structures</b>   |                |                 |
| Direct Embedded Wood Sign Supports  | No             | TL-3            |
| Single and Multiple Extra Large Mailboxes on Different Supports                   | Yes            | TL-3            |
| <b>Work Zone Traffic Control Devices</b>  |                |                 |
| Modified Single-Post Skid-Mounted Sign Support                                    | Yes            | TL-3            |
| <b>Terminals</b>  |                |                 |
| Sloped Concrete End Treatment for TL-3 Low-Profile Barrier                        | No             | TL-3            |
| <b>Miscellaneous</b>  |                |                 |
| Structurally Independent Foundation for 36-Inch-Tall Single-Slope Traffic Barrier | Yes            | TL-4            |
| Shape Transitions between Different Cast-in-Place Concrete Barriers               | Yes            | TL-3            |
| Concrete Barrier-Mounted Containment System for Motorcycle Riders                 | Yes            | Not applicable* |

\*Motorcycle test conditions are not currently included in *MASH*.

### For More Information

**Project Manager:**

Wade Odell, TxDOT, (512) 416-4737

**Research Supervisor:**

Roger P. Bligh, TTI, (979) 317-2703

Technical reports when published are available at <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](http://www.txdot.gov)

Keyword: Research