



Project Summary

Texas Department of Transportation

9-1002: Roadside Safety Device Crash Testing Program

Background

Under this study, roadside safety issues were identified and prioritized for investigation. The selected safety issues were evaluated through engineering analyses, computer simulation, dynamic impact testing, and full-scale vehicular crash testing as appropriate. Factors such as impact performance, maintenance, and cost were considered.

What the Researchers Did

Texas T101 Bridge Rail

Testing and evaluation of the Texas T101 bridge rail was recommended based primarily on concerns that the 27-inch rail height may not be compatible with pickup trucks and SUVs under design impact conditions.

TxDOT Median Barrier Gate

Long, continuous runs of concrete median barriers (CMBs) limit access of emergency and maintenance vehicles to the other side of a roadway or a managed lane. A new median barrier gate was developed and crash tested.

TxDOT Single Slope Bridge Rail (Type SSTR) on Pan-Formed Bridge Deck

This research effort determined whether the TxDOT Single Slope Traffic Rail (Type SSTR) would perform acceptably on a thin pan-formed deck when tested according to the guidelines in American Association of State Highway and Transportation Officials (AASHTO) *Manual for Assessing Safety Hardware (MASH)*.

31-inch W-Beam Guardrail with Standard Offset Blocks

Based on impact performance concerns with existing guardrail designs and Federal Highway Administration (FHWA) on guardrail height, TxDOT is exploring the use of a 31-inch tall guardrail. Concerns were expressed regarding the increased size of the blockout used in the Midwest Guardrail System (MGS). Therefore, a 31-inch tall guardrail system that incorporates conventional 8-inch deep offset blocks was evaluated.

Determination of Minimum Height and Lateral Design Load for MASH Test Level 4 Bridge Rails

The severity of Test Level 4 (TL-4) impacts increased substantially in *MASH*. Consequently, 32-inch tall barriers do not satisfy *MASH* requirements. This research had the objectives of determining the minimum rail height and lateral design impact load for *MASH* TL-4 bridge rails.

Downstream Anchor Terminal

Consideration of the use of 31-inch tall guardrail raised concerns regarding the use of a turndown anchor on the downstream ends of guardrail that are outside the clear zone of opposing traffic.

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A new downstream anchor terminal compatible with a 31-inch guardrail height was developed and crash tested to verify its performance in reverse direction impacts.

5-inch CIPD Barrier Anchors

A full-scale crash test was performed to evaluate the impact performance of the T223 concrete beam and post bridge rail anchored to a 5-inch cast-in-place deck (CIPD). *MASH* test test 3-11 was performed to evaluate the anchorage of the barrier to the 5-inch CIPD.

MASH TL-2 Transition

This research effort developed a transition that is suitable for use on lower speed roadways, less expensive and complex than the current high-speed (i.e., TL-3) transition design, and is compatible with 31-inch guardrail.

What They Found

- The T101 bridge rail did not meet *MASH* evaluation criteria for test 3-11 with the pickup truck. If continued use of the T101 bridge rail is desired, it is recommended that an in-service performance evaluation be conducted, or a new barrier system that satisfies the same key design criteria be developed.
- The new median barrier gate satisfies *MASH* TL-3 impact performance criteria and is considered suitable for implementation where cross-median access is desired.
- The TxDOT Type SSTR bridge rail on thin pan-formed deck performed acceptably for *MASH* test 3-11.
- The 31-inch W-beam guardrail with standard offset blocks met all required *MASH* performance criteria for test 3-10.
- The minimum rail height for *MASH* TL-4 barriers was determined to be 36 inches, and the lateral design load was determined to be 80 kips. The SSTR meets the rail height and lateral load capacity requirements and is considered suitable for implementation wherever *MASH* TL-4 protection is desired.
- The downstream anchor terminal performed acceptably in a reverse direction impact with a small car. It is suitable for implementation at locations where the downstream end of a 31-inch guardrail is terminated outside the clear zone for opposing traffic.
- The 5-inch CIPD rail anchorage detail is considered suitable for implementation when concrete bridge rails are attached to 5-inch decks cast on prestressed box and slab beams. The new anchorage detail can be used with the T223 bridge rail, other concrete bridge rails, and metal rails mounted on concrete parapets.
- The TL-2 transition was successfully crash tested and is considered suitable for implementation on roadways that have traffic conditions appropriate for the use of TL-2 safety hardware. This low-cost guardrail-to-bridge rail transition is compatible with 31-inch guardrail and can connect to rigid concrete bridge rails.

What This Means

The new roadside safety hardware developed under this project will improve motorist safety, reduce material and installation costs, and improve operations.

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