0-6711: Short Radius MASH TL-3 Guardrail Treatment

Background

When a roadway intersects a highway with restrictive features, such as a bridge rail, it becomes difficult to fit a guardrail with the proper length, transitions, and end treatment along the highway. Possible solutions include relocating the constraint blocking the placement of the guardrail or designing a short radius guardrail.

Short radius guardrails typically present the most viable solution. However, no previously designed short radius guardrails meet National Cooperative Highway Research Program (NCHRP) Report 350 Test Level 3 (TL-3) guidelines. Crash-testing criteria have been updated by the American Association of State Highway and Transportation Officials Manual for Assessing Safety Hardware (MASH). MASH uses heavier test vehicles than NCHRP Report 350. Therefore, meeting new impact standards for short radius guardrails has become even more challenging.

What the Researchers Did

Several concepts were developed and evaluated to establish a candidate design. High-fidelity simulations were conducted to fine-tune this candidate design. Later, simulations were performed to accurately predict the performance of the system under MASH TL-3 conditions. Subsequent full-scale crash tests (Figures 1 and 2) verified the performance of this recommended design. The final short radius system that was simulated and crash-tested consisted of an 18-ft-9-inch-long thrie beam that runs along the secondary roadway. The radius is 8 ft 4 inches and connects to the thrie beam on the primary roadway, which is 27 ft 5 inches long.

What They Found

A MASH TL-3 compliant 32-inch-tall short radius system was successfully developed and crash-tested as a result of this project. This innovative design uses an energy dissipation component plus a cable anchor that provides tension capacity to the primary roadway rail section. These ideas made the system effective in capturing the vehicles in the shortest distance without using complicated designs.
What This Means

The Texas Department of Transportation and other transportation agencies have a MASH TL-3 crashworthy short radius system (Figure 3) available for use in constrained intersections found in the highway system. This design demonstrates a significant safety improvement compared to existing short radius designs.

Figure 2. Simulation and Crash-Test Results with a Small Car.

Figure 3. Short Radius Guardrail System.

For More Information

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