Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6895: Development of Low-Maintenance Cost Median Barriers with Enhanced Safety Features

Background

Median barriers separate opposing traffic lanes on divided highways. Typically, rigid median barriers are made of reinforced concrete using safety or single slope profiles. Damaged median barriers typically require lane closures, which result in congestion and additional costs to repair the damaged section. Furthermore, the risk posed to the occupants inside a vehicle that impacts a rigid barrier is more severe than the risk to vehicle occupants impacting a flexible or semi-flexible barrier. The smallest level of flexibility can potentially enhance occupant risk values while reducing damage to the barrier. Researchers at the Texas A&M Transportation Institute and the Center for Transportation Research at the University of Texas developed a new generation of median barriers to maximize the safety performance of the barrier and incorporate low-maintenance cost features in the design that are associated with post-impact maintenance.

What the Researchers Did

Researchers designed a new generation of median barriers for the Texas Department of Transportation (TxDOT) through computer simulation and state-of-the-art optimization technologies. Researchers reviewed traditional and nontraditional construction materials, technologies, shapes, designs, and crashworthiness of concrete median barriers. Researchers identified new trends in median barriers, reinforcement details (e.g., wire mesh and fiber), barrier profiles, and performance during and after a dynamic impact. Full-scale crash testing was conducted according to the latest version of the American Association of State Highway and Transportation Officials *Manual for Assessing Safety Hardware* (*MASH*) standards to evaluate barrier crashworthiness.

What They Found

The Texas single slope traffic railing was selected as the optimum barrier shape. When combined with a semi-flexible anchorage design, it provides the most effective shape to help mitigate occupant risk. To achieve the semi-flexible behavior of the barrier, a flexible connection between the barrier and the pavement to which it was attached was made by using elastic rubber anchors. TxDOT Class C concrete provided the most reasonable mixture design based on cost and level of performance, but incorporation of rubber particles in the concrete was found to alter the crack propagation of the concrete barriers (see Figure 1). The results suggest that the toughness of the concrete was improved by the rubber inclusions. Overall, finer, more distributed cracks were seen in the mixture containing rubberized

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particles, which is beneficial since concrete durability decreases as crack widths increase. Preliminary studies on chemical treatment of the rubber particles to improve rubber-cement matrix bonding showed promising results.

The rubber anchoring system performed acceptably for *MASH* TL-4, and the barrier behaved more like a semi-flexible barrier system when impacted by an errant vehicle. The increase in barrier flexibility decreased the risk posed to occupants of an errant vehicle and reduced vehicular damage. Additionally, the increase in flexibility should allow the barrier to sustain greater impact loads with less permanent damage and simply return to or be pushed back into its original position after an impact.

What This Means

A new generation of median barriers was developed to allow the flexible behavior of the barrier system when impacted by an errant vehicle. The implementation of this median barrier system will potentially reduce maintenance and repair costs and times, and increase the life cycle of median barrier systems.

(a)

(b)

(c)

Figure 1. Field Testing of Median Barrier: (a) Installation of Median Barrier with Pickup Truck, (b) Wider Cracks in Control Concrete Mixture after Bogie Test, and (c) Narrower, More Distributed Cracks in Concrete Mixture Containing Recycled Rubber Particles.

For More Information

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