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Research Results

# Roadside Safety Research for MASH Implementation: TTI (Texas Transportation Institute) Pooled Fund Project TPF-5(343)

Advanced Research

**October 2025**

**Project Title:** TTI (Texas Transportation Institute) Roadside Safety Research Pooled Fund Project

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The objective of the Roadside Safety Pooled Fund Program is to provide a cooperative approach to conducting research on roadside safety hardware. Emphasis was placed on assisting State Departments of Transportation (DOTs) with their implementation of American Association of State Highway and Transportation Officials (AASHTO) Manual for Assessing Safety Hardware (Manual for Assessing Safety Hardware (MASH) 2016) and addressing other roadside safety needs of common interest.

## WHAT WAS THE NEED?

The implementation of MASH 2016 by State DOTs necessitates the examination and evaluation of roadside safety hardware currently being used by the State DOTs. It is known that some currently used roadside safety hardware will not meet MASH requirements. The federal compliance dates for MASH roadside safety hardware have already passed and research was needed to meet California's safety goals.

## WHAT WAS OUR GOAL?

The goal of this research was to provide roadside safety solutions to member states and improve the safety of roadway departure crashes. Reaching the goal will improve the safety of California roads and bridges.

## WHAT DID WE DO?

This project created a consortium of states that cooperatively funded and oversaw MASH 2016 implementation and roadside safety research. The needs were identified and prioritized by state representatives. The pooled fund research program identified, analyzed, and developed solutions for roadside safety problems with the goal of reducing the tremendous loss of life that occurs on our highways each year because of roadway departure crashes. Specific research

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activities addressed within the program included the design, analysis, testing, and evaluation of roadside safety hardware, and the development of guidelines for the use, selection, and placement of these features.

Research problem statements were developed by participating member state representatives. The members ranked and selected specific projects to be funded each fiscal year. Additionally, member states were also able to independently develop and fund research projects with the Roadside Safety Pooled Fund Program through an agreement with Washington DOT.

## WHAT WAS THE OUTCOME?

There was multiple research projects completed in the Roadside Safety Pooled Fund Program TPF 5(343). These research projects were on roadside safety features such as guardrails, bridge rails, concrete barriers, portable concrete barriers, terminals, transitions, support structures, and work zone traffic control devices. These completed projects will be used to address challenges related to roadside safety features in Caltrans in the implementation of MASH 2016.

In addition to the collaborative research projects among the State Departments of Transportation, a supplemental project was completed for Caltrans. This was on the CAL F23 portable concrete barrier with vertical anchors. The portable concrete barrier was tested and successfully passed MASH 2016 Test Level 3 standards for both anchored and freestanding installations on asphalt and on Portland cement concrete.

The Roadside Safety Pooled Fund Program is continuing in TPF 5(501).

## WHAT IS THE BENEFIT?

Each year state transportation agencies are faced with unresolved issues regarding roadside safety features. Research conducted under this program enables California to leverage funds to address these important safety issues. The pooled fund program is particularly valuable in addressing needs associated with the implementation of MASH. The continuity provided by the multi-year format permits research problems to be solved in less time than would normally be required if each issue were individually contracted. Safety research needs of an individual participating state could be addressed through additional funds to the program. The benefits were reduced cost and expedited contracting.

The result of this work is a reduction in fatalities and serious injuries associated with roadway departure crashes in California and other participating states. Further, California saves money through the development and implementation of more cost-effective roadside safety hardware and more efficient procedures and guidelines for their use.

## LEARN MORE

https://www.roadsidepooledfund.org/wp-content/uploads/2025/05/Summary-Report-TPF-5343-2025.05.Final_.pdf
https://www.roadsidepooledfund.org/

## IMAGES

**Image 1:** CAL F-23 Portable Concrete Barrier: Design and Testing of MASH TL-3 Compliant Anchored F-shape Portable Concrete Barrier System with Vertical Anchors

**Image 2:** GUARDRAILS: MASH TL-3 Testing of a Thrie-Beam Guardrail System at a Fixed Object

**Image 3:** BRIDGE RAILS: Development of Thrie-Beam Retrofit for Upgrading Obsolete Bridge Rails

**Image 4:** CONCRETE BARRIERS: MASH Test 4-12 on Keyed-in Single-Slope Barrier with 40-ft Segment Length

**Image 5:** PORTABLE CONCRETE BARRIERS: MASH Testing of Free-Standing and Pinned Temporary Concrete Barrier

**Image 6:** TERMINALS: MASH Tests 3-34 and 3-35 on the 31-inch Buried-in-Backslope Terminal Compatible with MGS Guardrail

**Image 7:** TRANSITIONS: MASH Test 3-21 Evaluation of Short W-Beam Transition

**Image 8:** SUPPORT STRUCTURES: Testing and Evaluation of Large Sign Slipbase Support on Slope

**Image 9:** WORK ZONE TRAFFIC CONTROL DEVICES: Evaluation of Type III Barricades with Mounted Signs