Title:	Conduct MASH Test Level 3 (TL-3) Evaluations of Concrete Barriers on Roadside Slopes
The Problem:	Performance of concrete barriers have been evaluated by conducting vehicle impact crash tests on a flat terrain. In practice, concrete barriers often need to be placed on roadside slopes. By placing the barrier on a slope, the effective height of the barrier that engages an errant vehicle may be reduced since the vehicle may be airborne as it encroaches onto the roadside slope. This can result in the barrier not being able to safely contain and redirect the vehicle. In the past, TxDOT's 32-inch tall F-shape barrier was tested under NCHRP Report 350 criteria on a 1V:6H slope. It was determined that the barrier can be installed on, or adjacent to 1V:6H slope. Under the newer MASH testing criteria, the test vehicles used for evaluating the barriers are heavier and taller, with higher centers of gravity. There is a need to reevaluate the placement guidance for the F-shape concrete barrier to ensure that when placed on a 1V:6H slope, it can successfully contain and redirect MASH TL-3 test vehicles. TxDOT often needs to place the concrete barrier on slopes as steep as 1V:4H. TxDOT's taller 42-inch single slope concrete barrier (SSCB) is a likely candidate for placement on slopes steeper than 1V:6H. TxDOT's current guidelines emanating from the Roadside Design Guide restrict placement of the concrete median barrier to certain offsets from the bottom of a median ditch. These guidelines were developed under NCHRP Report 350 criteria and may not be valid for MASH vehicles. The barrier placement guidance resulting from this project will allow TxDOT to place its concrete barriers on slopes in a manner that is compliant with current MASH safety criteria. By evaluating the barriers for slopes up to 1V:4H, this guideline will provide greater flexibility in barrier placement away from the edge of the travel way. It should be noted that by placing the barrier farther away from the travel way, it reduces the number of vehicle-to-barrier crashes, which in turn reduces fatalities and injuries, and results in a reduction in worker exposure while repairing the barrier or managing a crash site.

Technical Objectives:	The objectives of this project are:
	• Conduct a literature review and summarize state-of-the practice and key findings.
	• Develop guidance for placement of the 32-inch tall F-shape and 42-inch tall single slope barrier on slopes as steep as 1V:4H including:
	  ○ The maximum allowable roadside slope for each barrier type that it can be placed on.
	  ○ Any required offsets needed from the edge of the roadway or the bottom of the ditch for each barrier type for it to continue to work properly by safely containing and redirecting vehicles that encroach on to roadside slopes.
	  ○ Perform simulation of the vehicle encroachments on slopes up to 1V:4H slope to determine critical offset locations for placement of the F-shape and single slope concrete median barriers.
	  ○ Perform impact simulations with both barrier types to assess barrier impact performance and to determine the critical design configurations.
	• Conduct full-scale crash tests at the critical location for the two barrier types to verify simulation results and barrier performance on slopes.
	
	The expected technology readiness level (TRL) for this project is 8.

Anticipated Deliverables:	1. Technical memorandum for each task completed. 2. Monthly progress reports. 3. Project Summary Report 4. Research report documenting the findings of this research, including: • Guidelines for placement of the 32-inch tall F-shape and 42-inch tall single slope barrier on slopes as steep as 1V:4H. • Details and results of simulation testing. • Details and results of full-scale crash testing. • Value of Research (VoR) that includes both qualitative and economic benefits.

Proposal Requirements:	1. RFP#1 Q&A Deadline: 12:00 p.m. Central Time, **Tuesday, February 20, 2024.** 2. Proposal Deadline: 12:00 p.m. Central Time, **Thursday, March 21, 2024**. 3. Use the current "ProjAgre" and "PA Forms" templates located at the RTI Forms webpage. 4. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in RTI's University Handbook. 5. Proposals should be submitted by the University Liaison in PDF format; (1) PDF file per proposal. File name should include project name and university abbreviation. 6. This project will be tracked during the life of the project using the Technology Readiness Level (TRL) scale. 7. The 2021 Texas Legislative Session requires that universities be in compliance with Senate Bill 475 by submitting a completed and signed TxDOT Security Questionnaire (TSQ) to RTIMAIN@txdot.gov. Universities that have not submitted a completed and signed TSQ one week after award will be considered non-compliant and unable to participate in the Program.