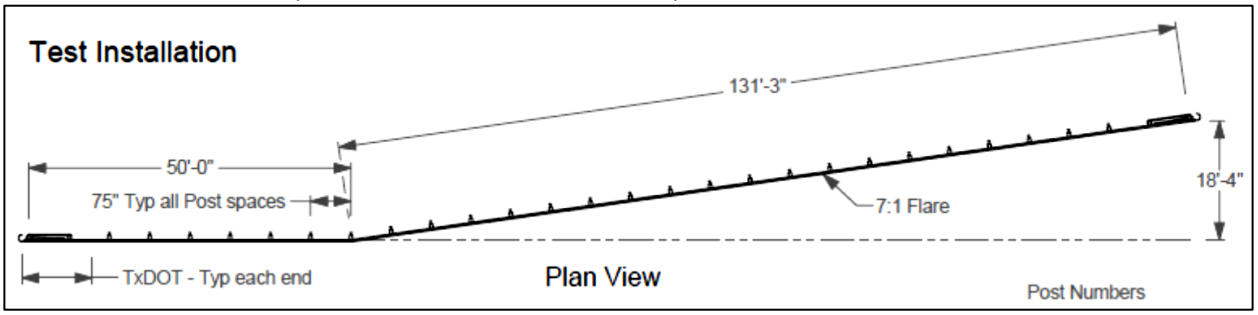
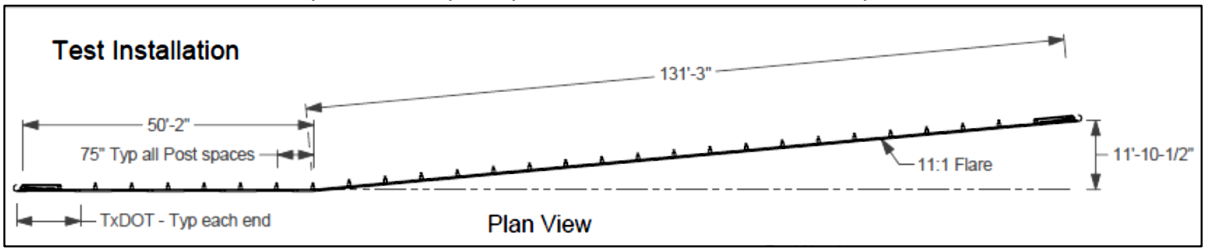
Roadside Safety Pooled Fund

Research Problem Statement

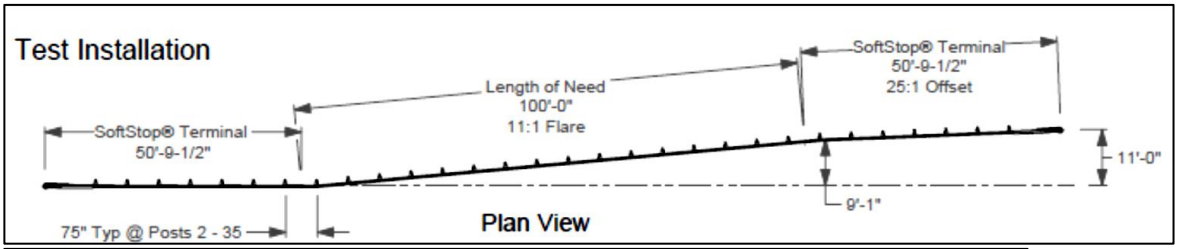
2024-07-LSRB

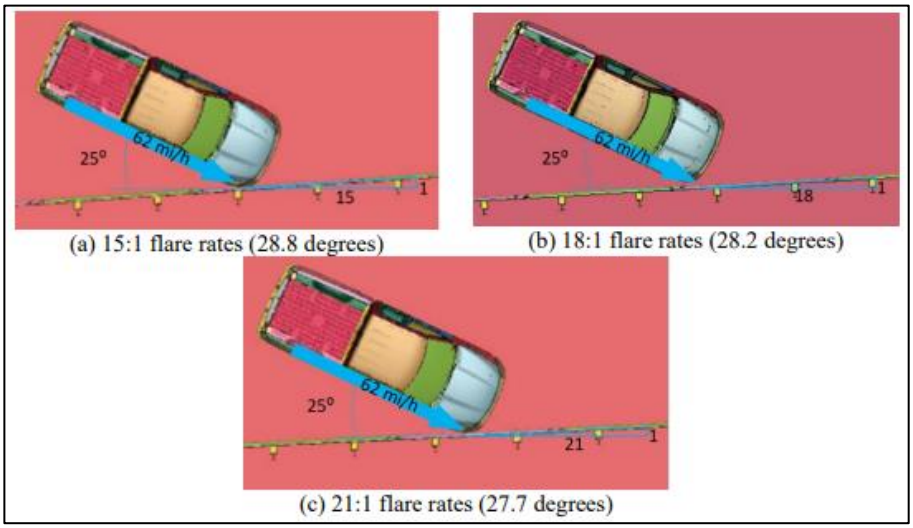
Project Title:	MASH TL-3 Design, Testing and Evaluation of a Flared Guardrail System - Phase 2 
Project Synopsis:	There is a need to continue the research from the recently completed Project 609971 "Testing and Evaluation of the MGS System with Critical Flare at *MASH* Test Level 3 Conditions". This project will continue the work required to develop a *MASH* Test Level 3 compliant flared guardrail system. If successful, a MASH compliant flared MGS barrier system would be available for State DOTs implementation at locations where a flared guardrail is a cost-effective/maintenance friendly solution.
Project Goal(s):	The successful completion of all required *MASH* TL-3 crash tests for a flared MGS guardrail system – either a modified MGS system at a 15:1 flare or an unmodified system at a flatter than 21:1 flare. If the modified MGS system is selected, the initial details of the system are provided through the recently completed pooled fund project 609971 "Testing and Evaluation of the MGS System with Critical Flare at *MASH* Test Level 3 Conditions" and further developed through this project.
Project Background:	The recently completed pooled fund project 609971-01"Testing and Evaluation of the MGS System with Critical Flare at MASH Test Level 3 Conditions" developed design details but unsuccessfully *MASH* crash tested an MGS guardrail system under the following flared installations: • 7:1 flared MGS system with small car – failed, ruptured rail  

- 11:1 flared MGS system with pickup truck – failed, containment problem due to failed anchor



- 11:1 flared MGS section with non-flared MGS sections at the end of the system (shortened flared section) with a pickup truck – failed, ruptured rail



	After the 3 crash test failures, the project performed the following computer modeling simulations to recommend next steps forward for the MASH flared MGS guardrail project: • MGS with flares of 15:1, 18:1, and 21:1 - Computer modeling indicated that the flared MGS would likely fail due to excessive lateral deflection/pocketing leading to rail rupture and high ridedown acceleration values.  (a) 15:1 flare rates (28.8 degrees) (b) 18:1 flare rates (28.2 degrees) (c) 21:1 flare rates (27.7 degrees) • Modified/retrofitted MGS including ½ post spacing, shortened blockouts, and rubrail – Computer modeling indicated that using a combination of shortened blockouts and rubrail with regular post spacing would reduce lateral deflections/pocketing and chances of rail rupture.  0.10 s 0.20 s 0.50 s 0.60 s **Computer Analysis Result showing Sequential Frames for Pickup Truck Impact at CIP on Modified 15:1 Flared MGS Retrofitted with Channel Rubrail.** After crash testing and computer analysis, Project 609971 ultimately recommended crash testing a modified and retrofitted MGS system with a 15:1 flare using regular post spacing, shorter blockouts (6-inch X 8-inch X 10-inch), C6X8 rubrail centered at 12-inches from ground, and a steel non-flared terminal (such as a SoftStop) to minimize chances of anchor failure in future testing.
Proposed Work Plan:	1.) Before Annual Meeting – If this problem statement is advanced for prioritization at the annual pooled fund meeting, conduct poll with member states to see if they prefer to: • Crash test the modified MGS system at a 15:1 flare recommended in Phase 1 of the flared MGS project; or, • Investigate, computer model, and crash test the unmodified MGS guardrail system at a shallower than 21:1 flare rate. Note: The poll to determine the direction of this project is needed before the annual meeting because each path will have a significantly different scope, schedule, and budget. 2.) Task 1. *MASH* Test Level 3 Full-Scale Crash Testing - Conduct full scale crash tests for the proposed system (modified or unmodified MGS) per MASH Test Level 3 conditions. *MASH* Tests 3-10 and 3-11 will be conducted, and test data will be evaluated according to the *MASH* evaluation criteria. 3.) Task 3. Reporting - Prepare a report presenting the testing results, provide recommendations for implementation, and discuss opportunities for further research as needed. If needed, support for request of an FHWA eligibility letter.

Deliverables:	The project's deliverable will be a crashworthy MASH compliant guardrail system for flared applications. The final report will summarize the results of the MASH TL-3 full scale crash testing, provide appropriate system implementation recommendations, and provide recommendations for further research opportunities.
Urgency and Expected Benefit:	Testing the prioritized flared guardrail installation will complete the evaluation a MASH TL-3 compliant flared guardrail design which began investigation through the previous pooled fund project 60991. If successful, this project will provide a much-needed MASH compliant flared guardrail system for states. Currently, there are no other research/testing studies have been funded either at national or state level to investigate flared length-of-need guardrail applications.
Problem Funding and Research Period:	**Total Cost and Schedule = TBD**
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