Roadside Safety Pooled Fund

Research Problem Statement

2019-06-LCB

Project Title:	MASH TL-4 Testing and Evaluation of Free-Standing F-shape Portable Concrete Barrier
Project Synopsis:	Evaluate and test a 42-inch tall, F-shape profile, pin-and-loop connection, free-standing Portable Concrete Barrier (PCB) in accordance with MASH. Perform the necessary steps to certify MASH compliance at Test Level 4 (TL-4), or TL-3, if TL-4 is not feasible.
Project Goal(s):	A Free-Standing Portable Concrete Barrier that is MASH TL-4 compliant
Project Background:	Oregon Department of Transportation designed a 42-inch PCB that met NCHRP Report 350 TL4 criteria. Several states use this design, or a similar design, and many miles are in-service today. This project would certify that this design or a similar design meets MASH TL-4 criteria. Under a PennDOT funded project, TTI is currently designing F-Shape PCB systems using a pin-and-loop connection keyed into asphalt to satisfy MASH TL-4 and TL-3 criteria. While the 42inch barrier will be the most commonly used, PennDOT also is seeking similar MASH compliant barriers at 32-inch and 50-inch heights for MASH TL-3 and TL-4 compliance, respectively. PennDOT would like to use the same barriers in freestanding conditions for use in temporary conditions. Temporary conditions typically do not lend themselves to embedment, but pinning the barriers could work if traffic is allowed on both sides of the barrier. It would be beneficial for PennDOT to have MASH TL-4 and/or TL-3 compliant temporary PCB systems.
Proposed Work Plan: Work with TTI	**Tasks:** 1. **Literature Review and Conceptual Design** In this task the research team will develop initial design of the free-standing 42-inch tall F-shape barrier with pin-and-loop connection. The design will be based on literature review of existing barrier systems that have passed MASH testing either with taller heights and/or for TL-4. The design concept will be presented for approval before proceeding with further tasks 2. **Simulation Analysis & Detailed Design** In this task the research team will develop detailed finite element model of the barrier system concept developed under Task 1 and perform impact simulations under MASH TL-4 test conditions. This will involve evaluating the likelihood of the barrier system passing MASH Test 4-12 (single unit truck), Test 4-11 (pickup truck) and Test 4-10 (small car). Based on the results of the simulations, design changes may be made to the design to improve its performance. Once a suitable design has been achieved, the research team will develop reinforcement details and detailed design of the barrier system that will be used to construct the barrier prototype and test installation for full-scale testing. 3. **Construction & Demolition** In this task the research team will develop prototype of the barrier system and complete test installations for crash testing. This task also includes demolition and disposal of the test installation at the end of the project. 4. **Crash Testing** In this task, the research team will perform full scale crash testing per MASH TL-4 criteria. Three crash tests will be performed, which are Test 4-12 (with single unit truck), Test 4-11 (with pickup truck), and Test 4-10 (with small car). This task also includes preparation of a detailed final report for the project.

Deliverables:	A report providing details of the free-standing PCB, documentation of the evaluation and crash tests performed, the results of each crash test, and the assessment of the performance of the PCB according to MASH specifications.
Urgency and Expected Benefit:	Several states use portable concrete barrier in a permanent installation. The major advantage of PCB is that, when used on a paved shoulder, or paved median with no embedment, it can be easily removed to accommodate pavement overlays and then replaced without damage. In Oregon, for example, PCB has been used as the standard barrier for narrow, paved medians. On facilities with high volumes and a high percentage of trucks, it is desirable to provide the additional protection of a TL-4 barrier. Freestanding PCB systems are oftenly used in temporary conditions. PennDOT has used their NCHRP Report 350 compliant PCB in both temporary and permanent conditions. The permanent PCB systems have been embedded, whereas the temporary PCB systems have been freestanding. PennDOT would like to do the same for its MASH PCB systems..
Problem Funding and Research Period: Work with TTI	**Total Estimated Cost = $309,057** Task 1 - $8,723 Task 2 - $46,140 Task 3 - $117,792 Task 4 - $136,402 **Work Schedule:** Estimated Project Duration = 12 months from initiation of the project
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