Roadside Safety Pooled Fund

Research Problem Statement

2019-09-LCB

Project Title:	Transition Between Guardrail and Tangent Anchored Portable Concrete Barriers
Project Synopsis:	Utah and other states install portable concrete barrier in permanent applications that require the last 3 barrier to be anchored before installing a crash cushion or w-beam transition and narrow shoulders that require tangent anchored barrier. At this time there are no transitions between w-beam or thrie-beam to anchored temporary concrete barrier tested to MASH criteria. Having one transition design for both anchored and free standing PCB's would simplify the design and construction process.
Project Goal(s):	Design a transition between guardrail and tangent anchored portable concrete barrier meeting MASH criteria.
Project Background:	The majority of highways that are constructed through mountainous areas are constructed with narrow shoulders. Anchored PCBs are used in these locations due to slopes steeper than 2:1, within rock fall areas or it is the local maintenance shed's preferred barrier system. See figure 1 & 2 for example. Test no. TRP-03-335 Midwest Guardrail System to PCB Transition is designed with free standing PCBs placed at a 15H:1V flare. This concept was designed to move the barrier end further way from the backside of the w-beam transition. Due to narrow shoulders there is insufficient room for flared anchored design to be installed.
Proposed Work Plan:	*Following work plan is expected to meet the objectives of this project.* *Task 1: Conceptual Design – In this task, various concepts of the transition from the W-beam to anchored PCB will be developed. The concepts will be presented to the Technical Representative for selection of one concept for further development through simulation and full-scale testing.* *Task 2: Simulation Analysis – In this task, full scale model of the transition concept will be developed and impact simulations with MASH Test Level 3 criteria will be performed to determine the performance of the design. Results of the simulation will be used to make relatively small modifications to the design to improve its performance.* *Task 3: Construction – In this task a full scale test installation of the anchored concrete barrier and the transition will be constructed. The budget for this task does not include construction of concrete barriers. It is assumed that 50-ft length of the concrete barriers can be provided by one of the states. The cost of shipping the barriers will be covered through this project.* *Task 4: Testing and Reporting – In this task MASH Test 3-11 and Test 3-10 will be performed at the downstream end of the transition. It is assumed that the upstream end of the transition can be kept the same as one of the existing transitions that have been previously crash tested. Doing this will not require testing at the upstream end of the transition. However, if this cannot be achieved, additional testing may be required at the upstream end, which can be performed by*

	either allocating more resources to the project, or by completing the testing in a second phase. A final project report will be prepared after completion of the crash testing.
Deliverables:	Compile summary report to document research effort, including literature review, CAD details, crash testing, and recommendations for further research in the event the of the system failing testing criteria.
Urgency and Expected Benefit:	*One transition design to be used for anchored temporary concrete barrier and if possible use for bridge rails and cast-in-place concrete barrier.*
Problem Funding and Research Period:	*Estimated Costs:* *Task 1 – $10,000* *Task 2 – $35,000* *Task 3 – $20,000 (includes cost for shipping concrete barriers to TTI)* *Task 4** *Test 3-10 – $40,000* *Test 3-11 – $45,000* **Assuming* *- Testing at upstream end of the transition will not be required, or will be done in a 2nd phase* *- Concrete barriers (50-ft) will be donated by one of the states* *Estimated Project Period: 12 months*
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Figure 1:

Figure 2: