TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Wisconsin DOT

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)*	**Transportation Pooled Fund Program - Report Period:**
TPF-5(193) Suppl # 78	☑ Quarter 1 (January 1 – March 31) ☐ Quarter 2 (April 1 – June 30) ☐ Quarter 3 (July 1 – September 30) ☐ Quarter 4 (October 4 – December 31)

Project Title:		
Transition from Free-Standing TCB to Reduced Deflection TCB		
Name of Project Manager(s):	**Phone Number:**	**E-Mail**
Schmidt, Bielenberg, Pajouh, Faller, and Reid	(402) 472-0870	jennifer.schmidt@unl.edu
Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:**
2611130090001		6/30/2014
Original Project End Date:	**Current Project End Date:**	**Number of Extensions:**
6/30/2017	6/30/2017	0

Project schedule status:

☑ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
$95,852	$52,958	80%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
	$9,077	

Project Description:

Recently, the Wisconsin Department of Transportation sponsored a research project to develop a retrofit design for reducing deflections for temporary concrete barriers (TCB) without anchoring the barriers to the bridge deck or roadway. This research was successful in reducing the deflection of the TCB system, as the addition of steel tubes to both the front and back sides of the barrier reduced the deflection of the TCB system by roughly 50 percent. However, the effort was focused on developing the length-of-need of the system and did not include design of a transition between the reduced deflection TCB system and standard F-shape TCB segments. Thus, a need exists to develop a transition between the new reduced deflection system and free-standing TCB segments.

The objective of this research effort is to develop a MASH TL-3 transition between the recently developed reduced deflection TCB system and free-standing, F-shape TCB segments. The research effort will focus on development of a design that safely transitions between the stiffness and deflection of the two barrier systems while maintaining vehicle stability. The design will also focus on minimizing the length of the transition and additional hardware components. Phase I of this project will involve initial development and computer simulation of the transition design (work described herein). Phase II of the project (currently unfunded) will include full-scale crash testing to evaluate the transition.

Main Objectives/Tasks

1. Literature Review
2. Concept Development
3. Selection of Transition Design
4. LS-DYNA Analysis and Evaluation
5. Project Report

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

Several alternative tube configurations for the joint spacers were explored to add more stiffness to the system. All of the alternatives increased the system stiffness and had similar performance when impacted by passenger vehicle models in the simulations. The thickest, single tube (a 3.5"x3.5"x3/8" tube) at the base of two joints adjacent to the transition was selected due to its easy installation and the improvement observed in the transition behavior. Further simulations with various impact points were conducted to determine the critical impact locations for the selected design.

The transition from reduced-deflection PCB system to free-standing PCB system incorporates two significant stiffness changes, one from the reduced-deflection PCB to the transition section and the other from the transition section to the free-standing PCB, both of which can increase the potential for pocketing, snag, and vehicle instability. Thus, it was recommended to conduct three full-scale crash tests, two tests according to test designation no. 3-21 using a 2270P pickup truck and one test according to test designation no. 3-20 with an 1100C passenger car. For test no. 3-21, two critical impact points (CIPs) were deemed critical: 4.3 ft (1.3 m) upstream the transition joint (MASH-recommended CIP) and at either 55 ft or 68 ft (16.8 m or 20.7 m) upstream the transition joint. Further simulations are being evaluated to finalize the second CIP. For test no. 3-20 with an 1100C car, the recommended critical impact point is 4.3 ft (1.3 m) upstream the transition joint (MASH recommended CIP). A meeting was held in April 2017, and the project progress and simulation results were discussed with the sponsor.

Writing continued on the report.

Anticipated work next quarter:

Simulation results will be evaluated, and the second CIP for the 2270P pickup truck will be selected. The report will be sent to the sponsors for their feedback.

Significant Results:

The optimal stiffness transition (utilizing two 3/8-in. thick tubes at two adjacent joints) was selected and successfully evaluated. Candidate critical impact points were determined and discussed with the sponsors.

Main Objectives/Tasks	% Complete
1. Literature Review	100%
2. Concept Development	100%
3. Selection of Transition Design	100%
4. LS-DYNA Analysis and Evaluation	90%
5. Project Report	50%

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

None.

Potential Implementation:

Development of a crashworthy transition system between the reduced-deflection TCB system and freestanding TCBs would provide states with a robust TCB system capable of reducing deflections without anchoring to the road surface. In addition, the system can be used in median applications and could be attached to standard, free-standing TCB segments on each end to allow for easier implementation and integration with existing work zones.