TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Nebraska Department of Roads

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)* TPF-5(193) Suppl. #90	**Transportation Pooled Fund Program - Report Period:** ☑ 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: Portable Concrete Barrier–Steel Cover Plate for Large Open Joints		
Name of Project Manager(s): Reid, Faller, Bielenberg, Lechtenberg, Rosenb	**Phone Number:** 402-472-9064	**E-Mail** srosenbaugh2@unl.edu
Lead Agency Project ID: 2611211120001	**Other Project ID (i.e., contract #):** RPFP-16-CONC-4	**Project Start Date:** 10/1/2015
Original Project End Date: 9/30/18	**Current Project End Date:** 9/30/18	**Number of Extensions:** 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
$118,925	$38,788	30%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
	$24,615	

Project Description:

Temporary concrete barriers (TCB) are commonly used to protect work zones and to shield motorists from hazards in construction areas. During setup or contractor operations in work zone areas, it is not uncommon to layout, construct, and connect free-standing TCB installations from different ends or to install barriers with a longitudinal gap between adjacent barrier segments. Longitudinal gaps can also be created due to tensioning issues following an impact event. These gaps can range from 6 in. to as long as a full barrier segment length, or 12.5 ft. Gaps in the barrier system pose a serious safety concern, but limited guidance is available for this situation. Overlapping two runs of barriers has been recommended in the past. However, the length of barrier overlap is relatively large and also requires significant lateral offset between the overlapped segments, which reduces available space in constricted work zones. Thus, a need exists to develop crashworthy and efficient methods for treating longitudinal gaps in adjacent runs of free-standing TCBs.

Previous research efforts to investigate gaps between adjacent TCB installations have focused on gate designs for providing emergency or maintenance access through temporary barriers. These devices include the ArmorGuard Gate, the BarrierGuard Gate, and the Vulcan barrier system. All of these gate systems are proprietary with fixed lengths that can be attached to permanent and temporary concrete barrier systems. While these systems have been crash-tested and demonstrated to function adequately, they are fixed-length solutions that would not be effective at spanning variable length gaps. In addition, these gates can be relatively costly to install.

For a more general solution to variable length gaps, the current guidance is to longitudinally overlap two adjacent barrier runs with a minimum of eight TCB segments and provide a minimum lateral offset of 2 ft between adjacent barrier runs. While this solution is adequate in terms of crashworthiness, it is not always manageable in terms of available space in the work zone. A more efficient solution would involve some form of gap-spanning hardware that could be adjusted for a variable gap length, would be easy to install and remove, and would be crashworthy. Crashworthiness of any design solution would require development of continuity (shear, tensile, and flexural loads) across the variable gap length and

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

Previously, the project sponsors voted to proceed with the design of both the 2-piece steel cover plate concept (Concept #7) and the thrie beam with toe plate concept (Concept #4). This quarter, the components of the 2-piece cover plate concept were sized and assembled in a preliminary LS-DYNA model. The model also included 200 ft of PCBs with a 12.5 ft gap in the middle. Initial impacts simulating MASH test 3-11 with the 2270P vehicle showed promise as the vehicle was smoothly redirected.

Anticipated work next quarter:

The preliminary model of the 2-piece steel cover plate will be subjected to numerous simulated impacts to evaluate the strength and performance of the design. If necessary, individual components will be modified, and the use of internal stiffeners will be evaluated. The simulations will consist of multiple impact points and multiple PCB gap lengths. If time permits, a model of the thrie beam and toe plate concept will be developed.

Significant Results:

A literature review was completed on State DOT standards, private manufacturer hardware, and a patent search. Next, 7 different conceptual designs were shown to the project sponsors for consideration. The sponsors voted to proceed with designing 2 concepts, a 2-piece end plate concept and a thrie beam with toe plate concept, through structural analysis and LS-DYNA simulations.

Objectives / Tasks	% Complete
1. Literature Review	100%
2. Concept Development and Analysis	100%
3. CAD details	25%
4. (Sponsor) Design Selection	75%
5. Computer Simulation	10%
6. CIP Study	0%
7. Project Summary Report	5%

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 system for spanning variable gaps in adjacent runs of TCBs would provide states with increased safety through removal of the hazard posed by interruption of the barrier continuity and would improve the flexibility of work zone operations by making it easier to move or coordinate TCB installations.