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)*	**Transportation Pooled Fund Program - Report Period:**
TPF-5(193) Suppl. #57	☐ 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:		
Weak-Post W-beam Guardrail Installed in Mow Strips		
Name of Project Manager(s):	**Phone Number:**	**E-Mail**
Reid, Sicking, Faller, Bielenberg, Lechtenberg	402-472-9324	srosenbaugh2@unl.edu
Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:**
2611211083001	RPFP-13-MGS-5	7/1/2012
Original Project End Date:	**Current Project End Date:**	**Number of Extensions:**
6/30/2015	6/30/2016	2

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
$162,896	$109,456	99%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
	$500	

Project Description:

Over the years, it has become desirable to place a longitudinal concrete slab or continuous asphalt pavement under W-beam guardrail systems in order to reduce the time and costs for mowing operations around guardrail posts. Likewise, many times guardrail posts must be installed in un-yielding pavements. Unfortunately, the placement of guardrail posts in pavement restricts energy dissipation by restricting the posts from rotating through the soil. Thus, installations in pavements have incorporated a blocked-out area or “leave-out” that surrounds each post. These leave-outs allow post rotation in the soil and result in acceptable safety performances for standard W-beam guardrails.

Recently, the MGS Bridge Rail was developed and successfully crash tested under the TL-3 MASH guidelines. This system utilized weak steel posts placed in tubular steel sockets that were side-mounted to a concrete bridge deck. The energy dissipation mechanism for this system was designed as bending of the weak posts instead of post rotation through soil. Since the posts are installed in rigid sleeves, MwRSF believes that the MGS Bridge Rail could be adapted for use in guardrail applications where mow strips are required. In this situation, it would be unnecessary to provide large leave-outs around the posts of guardrail systems installed in un-yielding pavements. Thus, The objective of this research effort is to adapt the MGS Bridge Rail system for use in mow strips and other pavements.

Objectives / Tasks

1. State survey of existing mow strip practices
2. System design and analysis
3. Dynamic bogie component testing
4. Full scale crash testing (MASH 3-10 and 3-11 tests)
5. Data analysis and evaluation
6. Written report documenting all design work, simulation, testing, and conclusions

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

Based off feedback received at the Midwest States Pooled Fund Meeting in April 2016, different states plan to install the Weak-Post MGS in both asphalt and concrete mow strips. As such, Hardware Guide drawings were created for both system configurations.

Anticipated work next quarter:

The eligibility letter will be completed and submitted to FHWA to qualify for federal reimbursement. Upon completion of the FHWA letter, the project will be closed.

Significant Results:

A survey of the Pooled Fund States revealed the critical mow strip to be 4 in. thick and 4 ft wide. Both asphalt and concrete versions of the mow strip shall be investigated through dynamic component tests. Component testing testing demonstrated that a 4" concrete pad has sufficient strength to withstand the impact loads without damage. However, testing within the asphalt mow strips illustrated that the posts will push through the asphalt and displace up to 3 inches.

When a 10" wide shear plate was welded to the back of 24"-30" deep sockets, both lateral and longitudinal tests resulted in minimal damage to the 4" asphalt mow strip and minimal displacements to the socket. However, an impact of dual 24" sockets spaced at 37.5" within 4" of asphalt resulted in asphalt fracture socket rotations.

A full-scale test was conducted on the weak-post guardrail system placed within 30" deep sockets spaced at 17.5" along the centerline of a 4' wide, 6" deep asphalt mow strip. The system successfully redirected the 2270P vehicle, but the asphalt behind the posts was damaged. A 2"-3" crack opened along the post line throughout the impact region of the system and the asphalt behind it was pushed back and cracked further.

Another dual post test was conducted, this time with the posts installed in a 4" thick by 4-ft wide concrete pad. During the test, the posts bend over and the concrete pad remained undamaged. Thus, if a mow strip is desired that won't require pavement repairs after impacts, a 4" concrete mow strip is recommended for use in combination with the weak-post guardrail system.

Objectives / Tasks	% Complete
1. State survey of existing mow strip practices	100%
2. System design and analysis	100%
3. Dynamic bogie component testing	100%
4. Full scale crash testing (MASH 3-10 and 3-11 tests)	100%

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).

Matching funding in the amount of $60,000 was obtained through the Mid-American Transportation Center. With these matching funds, additional component testing was conducted to explore various options for installing the S3x5.7 posts within both concrete and asphalt mow strips. Thus, the project is currently running behind the original schedule.

Potential Implementation:

Adapting the MGS bridge rail to be placed in various pavements will allow designers to install the weak post, MGS system in mow strips without requiring leave-outs, breakaway posts, or other additional hardware. It is anticipated that the new post foundation design will significantly reduce labor and system costs associated with installation, repair, and maintenance of guardrail installed in mow strips and other pavements. Insight will also be gained regarding the potential performance of other weak post guardrail systems when installed in mow strips.