

TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Iowa 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 # TPF-5(295)	Transportation Pooled Fund Program - Report Period: Quarter 1 (January 1 – March 31, 2015) Quarter 2 (April 1 – June 30) X Quarter 3 (July 1 – September 30) Quarter 4 (October 1 – December 31)	
Project Title: Midwest Smart Work Zone Deployment Initiative		
Name of Project Manager(s): Dan Sprengeler	Phone Number: 515-239-1823	E-Mail Dan.Sprengeler@dot.iowa.gov
Lead Agency Project ID: Keith Knapp	Other Project ID (i.e., contract #): Addendum 535	Project Start Date: July 1, 2014
Original Project End Date: June 30, 2020	Current Project End Date: June 30, 2019	Number of Extensions: None

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
\$700,000 (committed)	\$131,769.36	0

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
\$16,520.97		0

Project Description:

The Midwest Smart Work Zone Deployment Initiative (MwSWZDI) was initiated in 1999 as a Federal Highway Administration (FHWA) Pooled Fund Study intended to coordinate and promote research among the participating states related to safety and mobility in highway work zones.

The program is an ongoing cooperative effort between State Departments of Transportation, universities, and industry. The studies completed have consisted of evaluations of various work zone related products, various innovative topics, and several synthesis studies. Completed reports and descriptions of ongoing projects can be obtained at the Iowa State University's Institute for Transportation (InTrans) website (www.intrans.iastate.edu/smartwz/) link to the Smart Work Zone Deployment Initiative. InTrans currently operates as the program manager of the pooled fund efforts and completes administrative tasks related to request for ideas and proposals, meetings, project files, quarterly reports, and recommending reimbursement.

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**Quarter Ending September 30, 2015 (Overall)**

During this quarter we communicated with a number of principal investigators as needed. Resolved some progress issues if they occurred. All four Year 2014 and 2015 contracts progressed (see below). One of the projects was provided a no-cost extension. In addition, the request for problem statements had a deadline in July and 23 topic areas were suggested. The problem statements were summarized for the board and meeting was held on August 25, 2015 to determine which of them should advance. A few of the problem statements were altered as requested by the Board. Overall, however, ten of the problem statements (some included parts of several problem statements also) were included in a request for proposal that was released on September 8, 2015. This request went to potential university principal investigators. The deadline for submittal of proposals is October 16, 2015.

The following is a summary of accomplishments from July to September, 2015 for the Year 2014 and 2015 individual research projects under fund account TPF-5(295).

2015 Program Projects

- Evaluation of Alternative Work Zone Signing, University of Wisconsin – Madison, Madhav Chitturi as PI.

This project officially started June 1, 2015. A technical advisory committee has been developed. The kickoff meeting has been scheduled for July 9, 2015 and was held. The literature review is ongoing and expected to be completed on 10/31/2015. This project is 10% complete. It is expected to end by August 31, 2016.

- Developing a Data Driven Traffic Impact Assessment Tool for Work Zones, University of Missouri-Columbia, Praveen Edara as PI.

This project is officially started June 1, 2015. A project TAC has been identified. TAC consists of three members: Dan Smith, Jerica Holtsclaw, Jon Nelson, from Missouri DOT. A kickoff meeting was held on July 10 at Missouri DOT traffic division in Jefferson City, MO. Acquisition of data has begun. Data pertaining to work zones in St. Louis, travel time probe data, and detector data (speeds, volume) are being acquired for developing the model. Per TACs recommendation, PIs are working with St. Louis TMC to acquire work zone data for 2014 and 2015. The literature review is underway. Review is

focused on studies that developed traffic impact analysis tools for work zones using real-world traffic data. Work zone data for St. Louis was recently provided by MoDOT in the form of email alerts. The raw data files are currently being processed to extract relevant work zone information. The project is approximately 15% complete. It is expected to end by December 31, 2016.

- Orange Work Zone Pavement Marking Midwest Field Test, University of Wisconsin – Madison, Madhav Chitturi as PI.

This project started March 13, 2015. The literature review is ongoing. They are collecting information on standards and specifications of different agencies and also material specifications from different vendors. The identification of field test sites is behind schedule due to staff turnover at Iowa DOT and Wisconsin DOT. There is some risk that Iowa and/or Wisconsin will not be able to identify appropriate test sites. If that occurs our intent is to poll the other SWZDI states for candidate locations. Having difficulty in getting one of the major vendors to provide product data regarding its orange pavement marking tapes sold internationally. The project is about 10% complete. It is expected to end by September 30, 2016.

- Setting Work Zone Speed Limits, Iowa State University, Anuj Sharma as PI.

The survey has been designed and will be distributed. The survey generation was delayed on purpose to proceed through some more data analysis and data exploration to include the insight gain from the collected data prior to getting the input from other states. INRIX data for 13 work zone for year 2014 and 2015 was analyzed to understand the impacts on the speed at these locations. All the data has been downloaded, parsed and joined with geometric information and weather data. The crash data is currently being overlaid on this data set for crash analysis. Wavetronix sensor present in the 13 work zones is being analyzed to understand the impact on traffic characteristic curves. The VISSIM network will be created for one location and variable speed limit experiments will be run on this network. This project started March 15, 2015 and is approximately 50% complete. It is expected to end on May 31, 2016.

2014 Program Projects

- Work Zones in Innovative Geometric Designs Locations, University of Missouri, Henry Brown as PI.

Development of Guidelines. Development of the Maintenance of Traffic (MOT) Phasing diagrams for both initial construction and maintenance of roundabouts, SPUIs, DDIs, RCUTs, MUTs, and DLTs was completed. There are 37 drawings for initial construction and 31 drawings for maintenance. Descriptive notes to these drawings have been added. Copies of the drawings have been added to the Appendix to serve as a standalone guide. Case studies for the final report have also been completed for each of the innovative designs.

Draft Report Preparation and Review. A draft of the report was completed and sent to the TAC and sent for review on August 14, 2015. Comments were received from Kristi Ericksen on August 28, 2015. The report has been revised to address these comments. Comments from the other TAC members are pending. The project is currently 90 percent complete and had an original end date of June 30, 2015. An additional two month no-cost extension to November 30, 2015 has been granted.

- Safety Assessment Tool for Construction Work Zone Phasing Plans, University of Missouri, Henry Brown as PI.

Survey. The online survey was sent to FHWA representatives, and one survey response from a FHWA

representative was received. A group of individuals from both the DOT and contractor survey was selected for follow up phone interviews. These phone interviews are currently in progress.

Data Collection. Work zone and crash data have been obtained from the MoDOT Transportation Management System (TMS). To help supplement the Missouri data for the project, work zone and crash data have been obtained from Kansas and Ohio. Data were also received from New Hampshire but were found to be unusable due to missing information such as AADT.

Data Analysis. Initial models to predict work zone crashes are being developed. Three group of models are being developed for freeways, expressways and rural two-lane highways. The other roadway functional classes do not have enough sample size in the data from 2009-2014. New work zone data including the speed and roadway functional classification were queried and analyzed. MUTCD thresholds were used to find the distance needed to be added before and after the work zone, to match the crashes to work zones. The location of WZ crashes were analyzed for freeway WZs. 85% of crashes occurred in the work area with the remaining crashes occurring in the advance warning area before the work zone and the transition area after the work zone. New data regarding the number of entrance and exit ramps for freeways is being gathered manually to be used in the model. Minimum thresholds for work zone length and duration were investigated. Freeway work zones with duration greater than 10 days were chosen to be used in modeling, because this threshold produced the most accurate model. The project currently 70 percent complete and has an end date of December 31, 2015.

- Length of Need for Free-Standing, F-Shape, Portable 12.5' Concrete Protection Barrier, University of Nebraska, Ron Faller as PI

Previously, MwRSF completed simulation of impacts on the upstream and downstream ends of the 200 ft long barrier system to determine the length of need. It was determined that three barriers would be recommended for both the beginning and the end of length-of-need for the TCB system, until the results could be further discussed with the TAC.

The next step of the simulation analysis was to conduct impacts at the selected beginning and end of length-of-need lengths for a reduced system length in order to verify that the length-of-need definitions work for shorter lengths and to examine the minimum potential length of the TCB system. Simulation models were evaluated using a seven barrier long TCB system. The results of these models found that the 2270P vehicle was successfully redirected for the seven barrier installation at both the beginning and end of the LON. In both cases, the reduced barrier system increased barrier deflections by approximately 16" over the full-length, 16 barrier system. Additionally, the impact at the end of the LON indicated a potential for the last barrier in the system to rotate rapidly towards the vehicle as it was redirected and impact the vehicle door. Thus, while the vehicle was redirected and the increases in deflections were manageable, the impact of the barrier with the driver side door was a concern.

These findings were discussed in detail at the July 21st TAC meeting in order to determine what the TAC concerns were and what was desired to be investigated through full-scale testing. The TAC indicated that the rotation and impact of the end barrier with the vehicle was a concern and wished to analyze the system with eight barriers, 3 for the beginning of LON, one in the middle, and 4 on the end of the LON. These models were simulated. Again both models successfully redirected the impacting vehicle. The addition of the fourth barrier on the end of LON mitigated the impact of the barriers on the vehicle door. Barrier deflections for impact at the beginning and end of LON for the 8 barrier installation were found to be 94.8 in. and 90 in., respectively. Additional, review of the models remains, but it appears that the use of an eight barrier system will be recommended for full-scale crash testing in the upcoming quarter pending approval of the TAC.

In the next quarter, MwRSF will prepare for testing and evaluation of the reduced system lengths indicated by

the simulation analysis. Testing is anticipated for the 4th Quarter of 2015.

Simulations investigating the 85% impact severity on both the standard length and reduced length systems will be performed as well as simulations of intermediate system lengths under standard TL-3 impact conditions.

Currently, remaining tasks in the project include two full-scale crash tests, additional simulation of reduced length system deflections, and completion of the summary report. Funding for the project is adequate, but a time extension will likely be needed and requested in the 4th Quarter of 2015. This project is 45 percent complete and has an end date of December 31, 2015.

- Development of a TL-3 Transition between Temporary Concrete Barrier and Guardrail, University of Nebraska, Ron Faller as PI

In this quarter, MwRSF conducted all three of the full-scale crash tests for evaluation of the MASH TL-3 guardrail to PCB transition system. The test matrix is listed below.

1. MGSPCB-1 - Test no. 3-21 - Impact of the 2270P vehicle on the centerline of the fifth guardrail post upstream from the end-shoe attachment at a speed of 62 mph and an angle of 25 degrees.
2. MGSPCB-2 - Test no. 3-21R - Reverse direction impact of the 2270P vehicle 12 ft – 6 in. upstream from the end-shoe attachment at a speed of 62 mph and an angle of 25 degrees.
3. MGSPCB-3 - Test no. 3-20 - Impact of the 1100C vehicle on the critical impact point of the guardrail to PCB transition at a speed of 62 mph and an angle of 25 degrees. MASH procedures and engineering analysis will be used to determine the critical impact point.

All three of the full-scale crash tests successfully met the MASH TL-3 criteria. Thus, the system evaluation was completely successful. Currently, MwRSF is in the process of compiling the test report and recommendations for the implementation of the design.

In the upcoming quarter, MwRSF will attempt to complete the summary research report summarizing the testing and evaluation of the guardrail to PCB transition. Additionally, the project team will prepare a technical brief as well as a summary presentation of the research results for the TAC. This project is 70 percent complete and has an end date of December 31, 2015.

Anticipated work next quarter:

Work will continue on contracted projects. Several contracted projects, funded by the old pooled fund account (see the other quarterly report) were finalized this quarter. The last project will be finalized in April 2015. We will continue to work with the principal investigators of the Program Year 2014 project and the new principal investigators for Program Year 2015. In the next quarter the last Program Year 2015 project contract will be finalized and all Program Year 2014 and 2015 projects will continue. A work zone focus group and face-to-face board meeting will also be held to explore research ideas and the future actions of the pooled fund.

Significant Results:

Progress continued on all 8 projects from Program Year 2014 and 2015 projects occurred. The request for proposal for Program Year 2016 was released.

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).

Currently there are no problems to report with the administrative contract. Any issues that have come up with the individual projects that may impact schedule or budget are resolved on a case by case basis.

Potential Implementation:

None at this time. However, some of the projects funded under this account number for Program Year 2014 will be completed soon and the four Program Year 2015 projects are underway.