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)* TPF-5(302)	**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 1 – December 31)

Project Title: Modified Binder (PG+) Specification and Quality Control Criteria		
Name of Project Manager(s): Barry Paye	**Phone Number:** (608)246-7945	**E-Mail** barry.paye@dot.wi.gov
Lead Agency Project ID: 0092-14-20	**Other Project ID (i.e., contract #):**	**Project Start Date:** 9/30/2014
Original Project End Date: 9/30/2015	**Current Project End Date:** 9/30/2016	**Number of Extensions:**

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
$195,686.00	$68,891.93	55%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
$5,117.11 2.6%	$5,117.11	50%

Project Description:

The intent of this project is to provide essential information to five partner state agencies (Wisconsin, Ohio, Idaho, Kansas and Colorado DOTs) to support standardization of PG+ specifications by identifying those PG+ test methods that are reproducible and show promise in simulating actual field performance.
Based on the stated needs and goals, the main objectives of the proposed pooled fund research include:
1- Perform detailed assessment of current PG+ and modified binder quality control procedures in partnering states in terms of reliability, applicability, and relevance to performance and quality of modified asphalt binders.

2- Use a range of modified binders, representative of the products currently specified by partner states, to develop unified test procedures and specification criteria based on products placed in the field.

3- Improve product quality and reliability through conduct of ruggedness studies and development of precision and bias statements for selected tests.

4- Introduce consistency to current products supplied by elimination or reduction of differences in modified binder acceptance tests and criteria throughout member states.

5- Validate and establish relevance of suggested PG+ and quality control procedures in terms of mixture performance

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

To date, all the necessary materials to execute the pooled fund work plan were received at MARC with exception of one binder and corresponding mixture from Idaho. Progress in Quarter 3 has been dedicated to completion of Work Areas 1 and 2 of the pooled fund work plan; resulting in two task reports. Each task report provides a summary of the work that was completed within each Work Area. The first task report includes a summary of the current PG+ testing protocol for each partner state, a literature review of each current PG+ test, identification of new PG+ tests to improve the current state of practice and a commentary on the MSCR procedure as described in AASHTO T 315 and M 332. Task report 1 was submitted to the partner states on September 2, 2015.

In Area 2 of the work plan, each candidate test method identified to improve upon or replace current PG+ test methods was conducted on typical polymer modified binders provided by partner states. A Pooled Fund binder testing database has been created and will be available for each member's reference. Within the Pooled Fund binder database, summary tables and plots were created to analyze differences between new and current PG+ test methods. The second task report was written with the Pooled Fund database to meet the following objectives:

-Determine if candidate test methods can replace current Elastic Recovery, Ductility and Toughness and Tenacity PG+ test methods.
-Introduce new damage resistance based test methods as a compliment or supplement to current PG+ test methods.
-Recommend mixture performance test methods corresponding to each type of pavement distress in the field for future mixtures testing next Quarter.

In addition to results collected from the partner state binders, the Western Cooperative Testing Group's (WCTG) binder database was included into the analysis to provide a more robust set of data for analysis. Task Report 2 will be submitted

Anticipated work next quarter:

Next quarter the focus will be on the relationship between asphalt binder and mixture testing as outlined in Area 3 of the Pooled Fund work plan. Prior to beginning the mixture testing phase, candidate mixture test methods will be discussed with the partner states representatives to get agreement on which tests will be used. A summary table at the end of Task Report 2 provides recommended test methods that target each mode of pavement distress. After candidate test methods are selected, mixture performance testing will be completed at the end of Quarter 4 and beginning of Quarter 1 year 2.

In addition, MARC and partner states will begin data collection from field surveys and multi-lab variability testing after each state reviews and comments on Task Report 2. Field survey data will be added to the Pooled Fund database to identify correlations between field distress and binder testing results. Multi-lab variability testing, according to ASTM E 1169 and C 670, will be conducted on test methods that each partner state identifies as a candidate for implementation. Each partner state should identify three labs to conduct the variability testing, if applicable.

It is proposed that a conference call with representatives of Partner States be scheduled no later than Mid November to agree on the following items;

1. Mixture tests to be used
2. Field data collection steps
3. Multi-Lab variability testing and binder tests to be included.

Significant Results:

The following summarizes significant findings from data analysis of the Pooled Fund and WCTG binder testing:

• Phase Angle: Findings suggest that the ER DSR procedure is a more robust method for quantifying the degree of elasticity (in terms of elastic recovery) for the modified binders used in this study. Although the ER DSR procedure is run at 25 °C and the phase angle at the high temperature PG, a strong linear correlation exits between the two methods. Based on the analysis, the ER DSR procedure can be used as a direct replacement for phase angle. It is proposed that the binder samples tested for high temperature G*/sind be used for ER DSR testing at 25 degrees Celsius.

• Elastic Recovery (AASHTO T301): The ER DSR procedure was found to correlate reasonably well with the AASHTO T301 elastic recovery results. All binders tested in this study that passed the phase angle requirement also passed the elastic recovery requirements. The ER DSR procedure can directly replace the T301 recovery procedure with appropriate modification to the elastic recovery limits. If ER DSR is used, a reduction in the required elastic recovery of approximately 30% is suggested to maintain the equivalent level of T301 elastic recovery.

• MSCR Implementation: The results in this report suggest that if performance at high temperature (i.e. reduction of permanent deformation) is desired, a high temperature test method that measures that performance should be used. The binders supplied for this study were tested in the current MSCR procedure with the following findings:

o The MSCR %R cannot reliably be used to replace the T301 procedure; elasticity in the T301 procedure does not adequately predict high temperature elastic recovery using the MSCR. The decision should be made by each partner state whether the objective is simply to detect elastic response and ensure use of a specific amount and type of polymer

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).

Due to differences between the contract dates listed and the actual start date of the project, new start and end dates were requested and approved. The new start and end dates of the Pooled Fund project are 10/1/2014 and 9/31/2016, respectively.

Potential Implementation:

N/A