

## TRANSPORTATION POOLED FUND PROGRAM QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): Virginia 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.*

<b>Transportation Pooled Fund Program Project #</b> <i>(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i>  TPF-5 (225)	<b>Transportation Pooled Fund Program - Report Period:</b> <input checked="" type="checkbox"/> Quarter 1 (January 1 – March 31) <input type="checkbox"/> Quarter 2 (April 1 – June 30) <input type="checkbox"/> Quarter 3 (July 1 – September 30) <input type="checkbox"/> Quarter 4 (October 1 – December 31)	
<b>Project Title:</b> Validation of Hot-Poured Crack Sealant Performance Based Guidelines		
<b>Name of Project Manager(s):</b> Imad L. Al-Qadi	<b>Phone Number:</b> 217-265 0427	<b>E-Mail</b> alqadi@illinois.edu
<b>Lead Agency Project ID:</b> VCTIR 98160	<b>Other Project ID (i.e., contract #):</b>	<b>Project Start Date:</b> 09/01/2010
<b>Original Project End Date:</b> 09/01/2014	<b>Current Project End Date:</b> 09/01/2015	<b>Number of Extensions:</b> 1 extension for a year

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
730,000	588,690	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
47,468	47,468	89.6%

**Project Description:**

Recently, performance-based guidelines were developed as a systematic procedure to select hot-poured bituminous crack sealant. These guidelines are the outcome of the pool-funded North American Consortium led by the University of Illinois at Urbana-Champaign and the National Research Council of Canada. The work proposed a "Sealant Grade" (SG) system to select hot-poured crack sealant based on environmental conditions. A special effort was made to use the equipment originally developed by the Strategic Highway Research Program (SHRP), which was used to measure binder rheological behavior as part of the Performance Grade (PG) system.

These developed laboratory tests allow for measuring hot-poured bituminous-based crack sealant's rheological and mechanical properties over a wide range of service temperatures. Preliminary thresholds for each test were identified to ensure desirable field performance. Then, the preliminary thresholds were utilized in the SG system based on extensive laboratory testing, limited between-laboratory testing, and limited field performance data.

However, because the preliminary thresholds were determined based on only limited field data, mainly from Canada, a comprehensive field study is urgently needed to validate and fine-tune the present threshold values.

Furthermore, the developed guidelines should be validated in several states under various climate zones.

**Tasks:**

- I. Laboratory Validation
- II. Field testing and installations
- III. Test section monitoring
- IV. Threshold value fine tuning
- V. Cost effectiveness quantification
- VI. Development of crack sealant selection procedures and installation guidelines.

**Objectives:**

The developed laboratory tests and the new guidelines must be verified for precision and bias between laboratories as well as within laboratories. In addition, since preliminary thresholds were established for each test based on extensive laboratory testing but with limited field and within-laboratory data, an extensive field study is urgently needed to validate and fine-tune the threshold values. Hence, this proposed study aims 1) to validate the developed laboratory tests, 2) to determine the thresholds using a more diverse array of field performance data, and 3) to implement crack sealant guidelines for field application.

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

No meetings took place in the last quarter.

**Task-I: Laboratory Validation (80% completed):**

Progress in the laboratory testing is summarized as follows:

- Low temperature BBR and adhesion tests were used to characterize low temperature performance of field aged sealants. These field aged (FA2) samples are collected from Minnesota, Wisconsin and Ontario test sites during the second evaluation period from March to April 2013. A short report about the aging study will be provided to the panel members with the next quarter report. The report will include the results for two low temperature testing; bending beam rheometer (CSBBR) and adhesion test (CSAT).

- Sealant grading process at installation temperature is completed for all 17 sealants used in the test matrix using rotational viscometer.

**Task-II: Field Testing and Installation (100% completed):**

- This task was completed.
- A draft version of the field installation guidelines is attached for the review of panel members.

Task-III: Test section monitoring (75% completed).

Third survey took place through Feb 2014 to March 2014 for Minnesota, Ontario, New Hampshire, Wisconsin, and New York test sites. According to the preliminary analysis and observations, last winter had an extreme effect on the performance of sealants in almost all of the test sites.

Task-IV: Threshold value fine-tuning (60% completed).

The work on the field survey data is in progress including statistical analysis. Survey data were analyzed to investigate the effect of rout geometry, overbanding, installation temperature, and treatment type. Correlation between field and laboratory performance data is being investigated.

Task-V: Cost effectiveness quantification (0% completed).

No progress in this task this quarter.

Task-VI: Development of crack sealant selection procedures and installation guidelines (50% completed).

First draft of the installation guidelines is prepared. It is submitted to the panel with this quarter report.

**Anticipated work next quarter:**

1. Sealant grading process at high and intermediate in-service temperature will be resumed for the sealants used in the test matrix.
2. Laboratory testing will be conducted on the samples collected from ATREL sealants in October 2013 and March 2014.
3. The data collected during the third winter surveys will be analyzed.
4. Surface free energy method will be used to evaluate adhesion potential of the field-aged samples using sessile drop method. This information will be correlated to field performance.
5. A conference call is planned in the next quarter to discuss progress in the project.

**Significant Results:**

1. The results of the aging study show that BBR test has superior repeatability than the adhesion test.
2. A unique pattern does not exist in the results of low temperature stiffness of the materials exposed to 1.5 year field aging exhibit. The stiffness of some materials are higher than that of vacuum oven aged samples while some other remained similar and exhibited lower stiffness.
3. Low temperature characteristics of materials used in each test section shows a wide range of stiffness values.
4. The maximum load criteria appear to be a more repeatable adhesion parameter as compared to the bond energy.

**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).**

The research team has prepared an extension proposal and budget which will be shared by the project members soon. The extension will be needed to conduct some of the tasks agreed upon in the previous meetings. An updated budget is also prepared to cover the extension period. The new budget does not require additional commitment from the partners.

The research team is experiencing some technical difficulties with the air temperature control of the dynamic shear rheometer resulted in delaying intermediate and high temperature grading of study sealants.

**Potential Implementation:**

Based on the field validation study at various test sites, performance thresholds use in Sealant Grade System will be Updated. These thresholds were initially determined based on limited field data. The finalized grade system can be used by States and other agencies for selecting sealants based on climatic region. Sealant field installation guidelines will also be available at the end of this project.