

## 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 type="checkbox"/> Quarter 1 (January 1 – March 31) <input checked="" 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		
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<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> 12/31/2015	<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 (after revision 830,000)	773,852	90%

**Quarterly** Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
32,653	32,653	90 % (with updated schedule)

**Project Description:**

Recently, performance-based guidelines were developed as a systematic procedure to select hot-poured bituminous crack sealants. 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 this quarter.

**Task-I: Laboratory Validation (95% completed):**

Progress in the laboratory testing is summarized as follows:

- New adhesion molds are being used to evaluate adhesion properties of different sealants along with the existing adhesion molds recommended by AASHTO provisional test specifications. Results from both sets of molds will be used for the field and lab correlation.

- Interlaboratory test results from FHWA lab and Ontario ministry of transportation are delivered. By now, BBR and RV test results are received from at least five laboratories. MSCR testing using DSR is yet to be completed by other laboratories.

- CSBBR and DTT testing on the field aged samples collected from test sites is near completion. The results will be used to update the final report.

- ATLAS facility is used to evaluate field tracking of two sealants. Sealants were applied with overband and then, the temperature was elevated up to 60°C and was recorded every second. At each cycle of tire pass a picture was taken from

the test area at the same scale. The images are being processed by image processing software to measure the area of tracked sealants.

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

- This task is completed

Task-III: Test section monitoring (100% completed).

- This task is complete

Task-IV: Threshold value fine-tuning (90% completed).

- Field and lab performance of six selected sealants installed Michigan test site is evaluated and correlated. A draft report is available. There were a good correlation between CSBBR and CSDTT test methods and field performance of the sealants.
- Adhesion threshold will be validated and fine-tuned by this quarter

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

- LCCA analysis was initiated in this quarter with literature review and preliminary calculations. Based on the literature survey, life extension of a pavement by using crack sealing treatment varied between none to 3-5 years. Based on the work done by Ponniah et. al. and Wang et. al. studies (based on field data), an extension life of 1.7 years to 2 years are selected for further analysis.

For the cost effectiveness calculations:

- Sealing treatment cost data are requested from different DOTs to build up a database.
- Preliminary results show the cost effectiveness of crack sealing. The benefit ratio changes with the treatment type (filling or sealing) and the performance of the sealants (1 to 4 years)
- A simple LCCA tool is developed using Microsoft Excel.

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

The installation guideline was finalized.

#### **Anticipated work next quarter:**

1. ATLAS testing will be continued with additional sealants. The field data will be correlated with MSCR and yield test.
2. New adhesion molds will be used to evaluate sealants adhesion properties.
3. Adhesion test results will be validated by field and lab correlation.
4. Chemical and micro level testing will be continued on aged samples.
5. Interlaboratory task will be completed.
6. LCCA analysis and reports will be completed by using real costs collected from DOTs.
7. Final report of the project will be drafted.

#### **Significant Results:**

Based on the Michigan study, CSDTT and CSBBR are validated and have a good correlation to the field performance.

Minimum and maximum thresholds defined by CSBBR tests was able to capture field performance in multiple test sites including Michigan test deck.

**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).**

**Potential Implementation:**

Based on the field validation study at various test sites, performance thresholds 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.