

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.

Transportation Pooled Fund Program Project # <i>(i.e., SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX))</i> TPF-5 (225)	Transportation Pooled Fund Program - Report Period: <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)	
Project Title: Validation of Hot-Poured Crack Sealant Performance Based Guidelines		
Name of Project Manager(s): Imad L. Al-Qadi	Phone Number: 217-265 0427	E-Mail alqadi@illinois.edu
Lead Agency Project ID: VCTIR 98160	Other Project ID (i.e., contract #):	Project Start Date: 09/01/2010
Original Project End Date: 09/01/2014	Current Project End Date: 09/01/2014	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
730,000	369,045.69	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
35,949.03	35,949.03	64.6%

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 this quarter.

Task-I: Laboratory Validation (60% completed):

Lab aging investigation continued on the materials Ad, Bb, Ca, Da, Ed, Fb, Jd, Mb, Ob, and Kc using the test protocols of CSBBR, CSRv, adhesion, and CSDSR. The main objective of this task is to verify and fine-tune aging procedure developed in the first phase of the study. Short-term and long-term aging were considered using a lab melter, kettle aging, and field aged. The results have been compared to the accelerated laboratory vacuum oven aging procedure developed in phase 1.

Samples from the ATREL test section were collected after 18 months for characterization. The samples were sliced into two parts: "bottom" and "crust". Characterization of 18-month field-aged samples has started using the CSBBR and CSDSR tests.

The samples for inter-laboratory testing were prepared. Inter-laboratory testing packages were sent to five labs (Minnesota, Ontario, New Hampshire, Virginia, and Michigan). The testing program includes CSBBR, CSRv, CSDSR creep and yield tests.

The research team will use an accelerated test section at ATREL for tracking test validation. Two sections were routed and cleaned during the previous quarter. Loading will be applied after installation to simulate tracking failure of sealants. Six sealants were considered. Accelerated testing is expected to be done this summer.

Laboratory tests were completed on the samples collected from Michigan field test section. The testing program included CSBBR, CSDSR, and crack sealant direct tension (CSDT). The experimental plan included six materials exhibiting poor, fair, and good field performance. Field performance data were obtained from Michigan DOT. The correlation between field and lab performance test results were studied. Data analysis will be continued this quarter.

Task-II: Field Testing and Installation (100% completed):
Selection of a test site in San Antonio took place in January 2013.

Task-III: Test section monitoring (60% completed).
Second year winter evaluations were completed. Minnesota was completed on March 25 and 26th, Wisconsin test site was done on March 27th, New York test site was completed on April 4 and 5th, Ontario test site was done on April 8 and 9th, and finally New Hampshire test site was surveyed on April 10 and 11th.

Task-IV: Threshold value fine-tuning (10% completed).
Preliminary analysis of Michigan test site was initiated. This test site was constructed in 2010. Field survey data were obtained from Michigan DOT along with the samples used in the test section. Laboratory testing was completed for six of the materials used in this test deck. The correlation between laboratory and field performance has been investigated. Details of this study will be presented at the project meeting on May 1st.

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

Task-VI: Development of crack sealant selection procedures and installation guidelines (0% completed).

Anticipated work next quarter:

1. Project meeting will take place on May 1st.
2. Laboratory validation efforts will continue on the lab-aged and field-aged samples using adhesion, cohesion and CSDSR tests.
3. Testing will be completed for the inter-laboratory testing program.
4. The data analysis of inter-laboratory testing results will be initiated.
5. Analysis of the second round of field surveys of the test sections will be finalized.
6. Field tracking resistance test will be conducted using the accelerated testing facility at ATREL.
7. Sealant grading process will continue for all sealants used in the test matrix.
8. Testing of the 18-month field-aged samples from the ATREL test section will be finalized.

Significant Results:

Second year field survey results indicate significant deterioration of some of the sealants installed. Predominant failure type is adhesion and spalling. Spalling appears to be a significant problem in most of the sections. Average spalling in Minnesota is approximately 20-30% of the entire crack length. Spalling is usually due to missing cracks during routing operations.

Michigan test results indicate good correlation between CSBBR and CSDT test results and field performance except for one product.

Aging in the crust portion of the sealant subjected to 18-month of field aging (winter + summer + winter) is significant in some of the sealants. The ratio of stiffening can be as high as 4 with respect to the initial stiffness of the material in the kettle.

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 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.