**TRANSPORTATION POOLED FUND PROGRAM**

**QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): Minnesota Department of Transortation

**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.*

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| **Transportation Pooled Fund Program Project #***(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)*TPF-5(132) | **Transportation Pooled Fund Program - Report Period:**□Quarter 1 (January 1 – March 31)□Quarter 2 (April 1 – June 30)C:\Program Files\Microsoft Office\MEDIA\OFFICE14\Bullets\BD21301_.gif□Quarter 3 (July 1 – September 30)□Quarter 4 (October 1 – December 31) |
| **Project Title:**Investigation of Low Temperature Cracking in Asphalt Pavements - Phase II |
| **Name of Project Manager(s):**Tim Clyne | **Phone Number:**651-366-5473 | **E-Mail**tim.clyne@state.mn.us  |
| **Lead Agency Project ID:**Contract 89261 | **Other Project ID (i.e., contract #):**WO # 103 | **Project Start Date:**6/17/08 |
| **Original Project End Date:**1/31/12 | **Current Project End Date:**8/31/12 | **Number of Extensions:**2 |

Project schedule status:

□ On schedule □ On revised schedule □ Ahead of schedule □ Behind schedule

Overall Project Statistics:

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|  **Total Project Budget** |  **Total Cost to Date for Project** |  **Percentage of Work**  **Completed to Date** |
| $505,000 ($475k research; $30k admin) | $475,000 (+ 6 TAP meetings) | 100% |

***Quarterly*** Project Statistics:

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|  **Total Project Expenses**  **and Percentage This Quarter** |  **Total Amount of Funds**  **Expended This Quarter** |  **Total Percentage of**  **Time Used to Date** |
| 0 | $23,750 | 100% |

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| **Project Description**:The Minnesota Department of Transportation initiated this pooled fund study as a continuation of a long-standinginvestigation of low temperature cracking. The Phase I pooled fund study was aimed at developing a fracture mechanics-based specification for a better selection of asphalt binders and mixtures with respect to their resistance to crack formation and propagation.  The Phase I study has developed new models for intrinsic material properties, laboratory testing behavior, and mixture performance in an in-service pavement. An integrated approach that combines laboratory materials testing, numerical modeling, and prediction of pavement performance is taken in Phase II of this study. Part of this approach will include field validation of the aforementioned tests and models by constructing 3 test sections at MnROAD.  The main objective of this project is to develop test methods and specification criteria that will allow the selection of fracture resistant asphalt mixtures and binders at low temperatures. |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):***Task 7, Development of Draft AASHTO Standards and Final Report* – The TAP provided comments on the Draft Final Report to the research team. The research team incorporated the comments as appropriate and submitted the Final Report to MnDOT for publication. The final report contained chapters on Literature Review, Expand Phase I Test Matrix, Subtask on Physical Hardening, Develop Low Temperature Specification for Asphalt Mixtures, Subtask 1: Develop Test Method, Subtask 2: Develop Specification, Subtask 3: Proposed Simplified Method to Obtain Mixture Creep Compliance – Parts 1, 2, and 3, Develop Improved TC Model, Modeling of Asphalt Mixtures Contraction and Expansion Due to Thermal Cycling, Validation of New Specification, and Summary and Conclusions.The research team provided all of the laboratory test data collected during the project to MnDOT. This data is stored in the MnROAD database.The Illi-TC model was provided to the states in the form of a stand alone computer program and user guide. The developers have trained state users how to run the software and are providing continued support of the program.A final close out meeting/webinar was held on October 13th for this pooled fund study. Presentations included a general overview of the project and major findings, demonstration of the Illi-TC model, and implementation activities in Minnesota and Iowa. The focus of the meeting was how states are moving forward with the new DCT test method and low temperature cracking mixture specification.The Draft AASHTO Test Method for SCB was presented at the FHWA Asphalt Mixture Expert Task Group meeting in September in Minneapolis. The ETG will carry it forward through AASHTO on its way to becoming a provisional standard. |
| **Anticipated work next quarter**:This project is complete. |

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| **Significant Results:**Researchers have proposed specification limits for the chosen asphalt mixture fracture test, the DCT. These spec limits will differentiate between good and poor performers in terms of low temperature cracking. AASHTO standard test methods have been proposed for the SCB and BBR mix tests.  Significant improvements have been made to ILLI-TC. This model is a stand-alone program with a graphical, user-friendly interface.  The University of Wisconsin has developed sophisticated testing and modeling techniques to account for thermal stress buildup in asphalt mixtures.  Statistical analyses performed by ISU have shown that the DCT test does a good job differentiating between mixtures and their different parameters.State DOTs will need to decide how to best implement the results of this research project. In lieu of performing the DCT test and accomanying modeling, the research has demonstrated how mix parameters (i.e., air voids, aggregate type, aggregate size, binder grade, binder content, RAP/RAS content, etc.) affect the mixture resistance to thermal cracking.  |
| **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).** |

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| **Potential Implementation:** MnDOT and the other participating states may potentially revise their bituminous paving specifications to include a low temperature fracture test based on the results of this study. Iowa is in the process of developing performance specifications around the DCT test this year.  The states need to decide for themselves how the results of the study will be implemented. MnDOT is in the process of developing our “HMA Implementation Plan” through discussions between the Research Section and Bituminous Office.The MnDOT TL has received funding through both the Research Services Implementation Program and Destination Innovation to use the DCT test method and mixture specification on several construction projects in the 2012 and 2013 construction seasons. The goal of this implementation project is to take what we’ve learned in the pooled fund study and apply it to real-world construction projects in Minnesota. |