TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Lead Agency (FHWA or State DOT): MnDOT

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(132)	**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: Investigation of Low Temperature Cracking in Asphalt Pavements		
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:** 1/31/12	**Number of Extensions:** 0

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
$505,000 ($475k research; $30k admin)	$133,570 (+ 5 TAP meetings)	~50%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
0	0	92.5%

Project Description:

The Minnesota Department of Transportation initiated this pooled fund study as a continuation of a long-standing investigation 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.

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

A meeting was held April 19th between the TL and co-PIs to discuss progress to date and to set a plan moving forward.

T3 - Almost complete. Both UIUC and UMN team have developed methods to obtain creep from DCT or SCB test samples. A specification for fracture and for stiffness is in the process of being finalized. The rests of the subtasks are completed and are being incorporated into the task report.

T4 - Almost complete. Progress was made in coordinating the final compilation of the combined TCMODEL code, which includes a user-friendly interface, a climatic file database, a viscoelastic bulk response model, a cohesive-zone based fracture model, and a crack distribution model. Climatic files for 3 locations (denoted as Cold, Average, and Warm) within each participating state in the pooled fund study for a range of pavement structures are now being generated.

T5 - Almost complete. The effect of thermal cycling on the stress buildup and thermo-volumetric properties of MnROAD mixtures was investigated experimentally by means of the Asphalt Thermal Cracking Analyzer (ATCA). Furthermore, analytical modeling was conducted to determine the effect of physical hardening, relaxation, and glass transition behavior on the thermal stress buildup of asphalt mixtures.

T6 - The UIUC research team received additional lab and field cores for testing in the past quarter. UIUC is also conducting ruggedness and round-robin testing to establish precision and bias statistics for the D7313-07 specification for the DC(T) test.

T7 - Initial work in the development of the draft AASHTO has started based on input from the other tasks.

Anticipated work next quarter:

The Task 3 report (Field Testing) will be completed and delivered by August 30th. It will include a specification for both fracture and stiffness.

Task 4 (TCMODEL) will be completed in the next quarter, and model calibration and validation are also slated for completion in the next quarter.

The Task 5 (Thermal Modeling) report will be completed and delivered next quarter.

Work will continue on Task 6 (Validation of New Spec). All of the lab testing is expected to be completed, and data analysis will begin in earnest.

Work will also continue on Task 7 (Final Report and AASHTO Spec).

Significant Results:

Researchers are narrowing in on 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.

Significant improvements have been made to TCMODEL. This model will be 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.

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 is behind schedule, but looking to complete Tasks 3, 4, and 5 by August 31. Analysis of all of the experimental data and development of a new mixture specification are taking a significant effort, but the research team wants to make sure they get it right.

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 summer.