

MPC-496

July 31, 2015

Project Title:

Prevention of Low Temperature Cracking of Pavements

University:

University of Utah

Principal Investigators:

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Research Needs:

Cracking of asphalt pavements is the primary distress affecting highways in the Mountain Plains States. This results in increased maintenance costs and premature deterioration of the pavement structure. Just in the state of Utah, over \$20 million dollars are spend in rehabilitation of the highways; controlling cracking in pavements can potentially extend the life of the highway by 3-5 years resulting in 20% reduction of maintenance for a savings of \$4 million per year.

Research Objectives:

The overall objectives for this project are as follows:

1. Verify actual test limits for modulus and m-value of asphalt mixtures to prevent premature failures based on field laydown conditions (cores)
2. Verify if the same limits apply to field mix laboratory compacted samples
3. Establish relation between field mix and laboratory samples, including the effect of RAP
4. Investigate the effect of aging on laboratory samples
5. Determine if the proposes limits for modulus and m-value can results in increased binder content.

MPC funding will be used to develop a testing protocol to be submitted to the AASHTO Subcommittee of Materials (SOM) to be included as a provisional standard. At the conclusion of the project, a provisional AASHTO specification will be developed.

Research Methods:

In order to accomplish the study objectives, the following tasks are proposed:

Task 1 – Testing of Cores - Obtain density cores (PMFC: plant mix, field compacted) and volumetric-verification samples (PMLC: plant mix, lab compacted) from projects across the state. Contact the producer and obtain virgin material to prepare samples in the lab (LMLC: lab mix, lab compacted)

Task 2 – Testing of Plant Mix Lab Compacted samples - Test the PMFC samples and compare the results to proposed values for thermal cracking. Determine if any of the sections will be considered ‘at risk’ for low temperature cracking

Task 3 – Field Monitoring - Monitor the condition of the new road during two winters for signs of premature thermal cracking. Identify those roads that have cracked

Task 4 – Weathering - Test one third of the PMLC and LMLC samples soon after being prepared, place another third in an outside environment for at least six months to simulate natural field aging then test. Place the last third of the samples on the PAV oven to simulate accelerated aging. Test the aged samples to monitor the effect of weathering and compare the test results to previously known standards.

Task 5 – Lab Mix Lab Compacted Samples- Perform binder sweeps on the LMLC samples to determine the modulus and m-value of the mixtures change with increasing binder content

Task 6 – AASHTO Procedures – An AASHTO procedure will be developed and presented to the Subcommittee of Materials for adoption as a temporary specification

Expected Outcomes:

The following results are expected from this work

1. A limit based on the results of field samples that can be used to identify those sections that are at-risk for premature cracking. Preliminary work has been done to develop this relation based on cores as shown in figure 1.
2. A relation that allows the identification of at-risk sections during the design verification procedure
3. A specification that might result in a more balanced asphalt mix design

Relevance to Strategic Goals:

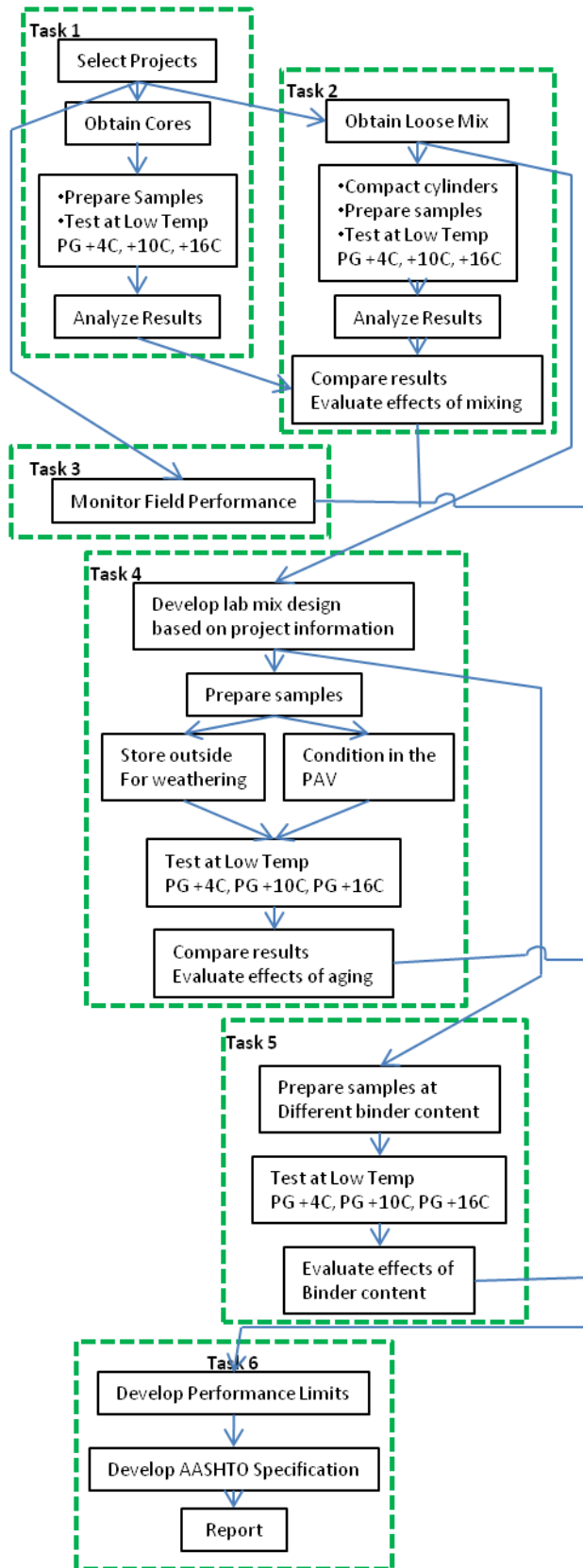
State of Good Repair is one of the central topics to be addressed. As previously stated, reducing the cracking of asphalt pavements can result in millions of dollars in savings in maintenance and rehabilitation costs.

Educational Benefits:

This project will allow for student involvement. Two students will be funded and will be required to write papers and participate in conferences.

Work Plan:

A graphical representation of the workplan, described under research methods is provided on the next page



Project Cost:

Total Project Costs: \$67,500

MPC Funds Requested: \$ 22,500

Matching Funds: \$ 45,000 Source of Matching Funds: Utah Department of Transportation

TRB Keywords:

Asphalt Concrete, low temperature cracking, pavement performance

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