DRISI
Caltrans Division of Research,
Innovation and System Information

Research Notes

Pavement

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Project Title:
PPRC 17 Performance Related Specifications

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Task Manager:
Junxia Wu
Transportation Engineer
junxia.wu@dot.ca.gov

Performance Related Testing in Superpave

Performance-related testing to complement current superpave mix design methodology adopted by Caltrans

WHAT IS THE NEED?

Superpave methodology for mix design was incorporated into Section 39 'Hot Mix Asphalt' (HMA) in the 2015 California Department of Transportation (Caltrans) Standard Specifications. Across the country for more than 30 years, the need has been identified for performance-related tests to provide a greater level of risk mitigation for rutting and cracking.

Caltrans and other states are continuously looking for suitable performance-related tests for routine mix design, quality control, and assurance testing. Tests that have been identified in previous projects for 'balanced mix design' considering both cracking and rutting need further validation and if suitable, calibration against both currently used performance-related tests and field performance. If suitable, the tests will be incorporated into standard Superpave mix design procedures and construction specifications.

WHAT ARE WE DOING?

The repeated load triaxial test using asphalt mixture performance tester (AMPT) will be evaluated for use in HMA mix design and Quality Control/ Quality Assurance (QC/QA) testing regarding rutting resistance, while the semi-circular beam fracture test will be evaluated, similarly, regarding cracking resistance.

If these tests are proved to be suitable, the research team will evaluate the recommended specification limits, using existing performance-related tests used on larger and more expensive projects. Specifically, the goal will be accomplished through the following tasks:

- Implement the use of the repeated load triaxial (RLT) test for HMA mix design and QC/QA testing
- Identify appropriate cracking tests for mix design and QC/QA testing
- Evaluate and account for differences between plant and lab produced mix
- Support implementation in pilot projects
- Evaluate commercial adoption of performance-related testing
- Write report to document the study

WHAT IS OUR GOAL?

The goal is to develop approaches for performance-related testing for rutting and cracking for routine asphalt mix design and to incorporate them into Caltrans' specifications, follow these approaches in pilot projects, and evaluate feasibility for commercial adoption.

The objective of this project is to develop performance-related testing to complement current Superpave mix design methodology adopted by Caltrans.

WHAT IS THE BENEFIT?

Fatigue/reflective cracking performance are not assessed in the Superpave mix design process. Longer-term evaluations of roads in several states, where the Superpave mix design procedure is used have indicated that early cracking may be a problem on roads where rutting resistance was the primary focus of the mix design.

An optimal mix design will balance rutting and fatigue-cracking performance by reducing the risk of rutting to an acceptable level, while at the same time maximizing fatigue-cracking performance and achieving at least a minimum required cracking performance. The RLT test using the Asphalt Mixture Performance Tester equipment and the semi-circular beam (SCB) test have potential for suitability for routine asphalt mix design and QC/QA testing.

WHAT IS THE PROGRESS TO DATE?

The following tasks are partially accomplished:

- Completing cracking test scans of specimens both before and after RLT, conducting analysis of changes in microstructures for specimens subjected to RLT, and finalize recommendations regarding RLT use
- Evaluating SCB for potential QC/QA use and establishing finite element modeling of SCB test. Continuing SCB and indirect tensile asphalt cracking test (IDEAL-CT) on Standard Materials Library and Heavy Vehicle Simulator test track materials. Collecting SCB and IDEAL-CT test results on mixes that are different only in Recycled Asphalt Pavement content
- Conducting the aging study to evaluate differences in plant and laboratory produced mixes, reporting difference in stiffness, fatigue, and permanent deformation performance between plant and laboratory-produced mixes
- Incorporating RLT and SCB in Interstate 5 Sacramento AC Long Life project, and Initiating round robin for RLT and SCB testing
- Developing survey questionnaire
- Documenting progress