DRISI
Caltrans Division of Research,
Innovation and System Information

Research Results

Microcracking for Cement Stabilized Layers: Phase 2 Test Road & Field

Develop guidelines for mitigation measures to limit/prevent shrinkage cracking in cement-stabilized layers.

Pavement

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Project Title:
Microcracking for Cement Stabilized Layers: Phase 2 Test Road & Field Project Evaluations

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WHAT IS THE NEED?

The California Department of Transportation (Caltrans) has been using full-depth reclamation (FDR) as a rehabilitation strategy since 2001. Caltrans has become interested in developing additional strategies such as the use of portland cement, alone, as an alternative stabilizing agent, where appropriate. However, shrinkage cracking associated with the hydration and curing of the cement-stabilized layers remains a concern, especially with regard to crack reflection through asphalt concrete surfacings and the related problems caused by water ingress. Based upon the results of phase 1 literature review, lab testing, and evaluations of FDR field projects, a test road with 36 sections was constructed on the campus of UC Davis to identify the important factors to consider in using the micro-cracking technique and how to implement it.

WHAT WAS OUR GOAL?

The objective of this project is to develop guidelines for mitigation measures to limit/prevent shrinkage cracking in cement-stabilized layers. The building of the test road will allow for evaluations of the various factors that influence the cracking (e.g. timing of the rolling, vibration settings, cement percentage, treatment depth, etc.). The factors that reduce large cracking will be incorporated into a micro-cracking guidelines.

WHAT DID WE DO?

Phase 2: Test Road and Field Project Evaluations

1. Continued monitoring of field projects where crack mitigation measures have been used on cement-treated layers.
2. Design and construction of a test road to compare different

crack mitigation techniques.

3. Evaluation of the test road to assess which crack mitigation strategies are the most appropriate.
4. Laboratory testing of specimens sampled from the test road and from field projects to compare laboratory test results with measurements from actual projects, and to identify suitable criteria for refining mechanistic-empirical design procedures and performance models for pavements with cement-treated layers.
5. Preparation of a project research report and guidelines for crack mitigation in cement-treated layers.

WHAT WAS THE OUTCOME?

The test road was constructed with 34 test sections and 4 control sections. The variations included were cement content, roller type, timing of microcracking, number of roller passes, target stiffness reduction, and level of vibration. Field testing included frequent visual evaluations, various lightweight devices to evaluate their effectiveness as quality assurance tools, as well as FWD testing. Preliminary observations of the cracking indicate that timing of the microcracking is dependent on cement content/design strength and that microcracking will reduce the severity of shrinkage cracks, but will not prevent them.

WHAT IS THE BENEFIT?

By developing guidelines for mitigation measures to limit/prevent shrinkage cracking in cement-stabilized layers Caltrans will have another recycling strategy to help maintain our network.

IMAGES

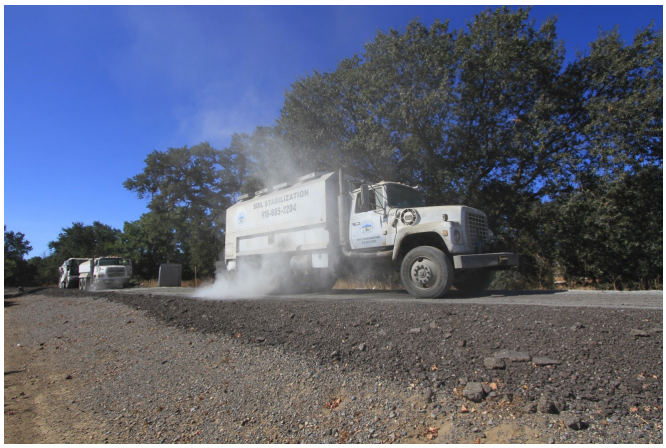

Image 1: Cement placement prior to being mixed into the asphalt and base

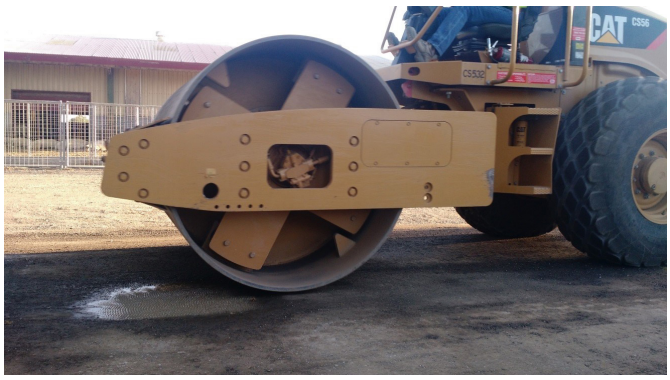

Image 2: Roller microcracking the newly cemented base at 24 hours.