

Material and Construction Optimization

for the Prevention of Premature Pavement Distress
in Portland Cement Concrete Pavements

TPF-5(066) Project Summary—February 2004

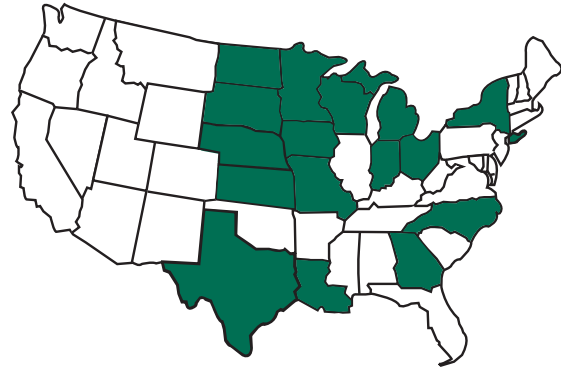
BACKGROUND ON THE PROJECT

Material and Construction Optimization (MCO) is a five-year (2003–2007) transportation pooled fund study with the following sponsors:

- Federal Highway Administration (FHWA)
- Iowa Department of Transportation (Iowa DOT) and 15 other state departments of transportation
- Center for Portland Cement Concrete Pavement Technology (PCC Center)
- American Concrete Paving Association (ACPA) and state paving chapters

The objectives of the project are as follows:

- Evaluate conventional and new technologies and procedures for testing concrete and concrete materials to prevent material and construction problems that could lead to premature concrete pavement distress.
- Develop a suite of tests that provides a comprehensive method of ensuring long-term pavement performance.



SUITE OF TESTS

A preliminary suite of tests to ensure long-term pavement performance has been developed and is currently undergoing evaluation in the laboratory and field. The tests examine concrete pavement properties in five focal areas—(1) workability, (2) strength development, (3) air system, (4) permeability, and (5) shrinkage. For each of these areas, tests have been identified as existent and adequate, existent but needing further development, or nonexistent and needing to be developed.

The tests being evaluated include the following: tests to determine the cementitious chemistry quickly and easily in order to evaluate compatibility; tests to evaluate early stiffening; and aggregate gradation tests. In addition, the air void analyzer will be evaluated for field application. Strength will be determined using the maturity method.

Researchers are currently evaluating the tests at three stages in the construction process—32 tests at the mix design stage, 25 at the preconstruction verification stage, and 16 at the construction quality control stage. Some of the tests will

be selected for further evaluation during each shadow demonstration project. A smaller number of tests will be recommended for implementation at the conclusion of the research.

SHADOW DEMONSTRATION PROJECTS

Shadow demonstration projects are being conducted to evaluate the preliminary suite of tests. These field projects will also demonstrate the testing technologies and procedures using local materials.

A 36-foot-long trailer is being designed and equipped as a mobile concrete testing laboratory to facilitate the shadow demonstration projects. Funding for the mobile lab is being provided by the ACPA and state paving chapters.

A pilot shadow demonstration of various tests was completed in Iowa in the fall of 2003. Additional projects are planned for the summer of 2004 in Missouri, Wisconsin, Minnesota, and other states.



INVOLVEMENT OF PARTICIPATING STATES

Visits to Participating States

Jim Grove, project monitor for the MCO project, has visited 12 of the participating states in the fall and winter of 2003–2004, with visits to the other four states planned for the spring of 2004. The visits serve the following purposes:

- Present an overview and update of the project to the participating states.
- Solicit details on past projects exhibiting premature pavement distress.
- Collect information on related state research, especially unpublished research.
- Collect information on current state practices for materials and construction testing.

Identification of Problem Projects

Participating states are helping to identify past projects exhibiting some form of early pavement deterioration. These projects may help researchers assess the causes of concrete pavement distress to ensure that proposed testing identifies the problem.

Compilation of State Research

State research relating to concrete mix properties and PCC paving practices is being gathered from the participating states and compiled into one useful document. The emphasis is on unpublished research that relates to material properties and construction practices of concrete paving.

Inventory of State Practices

Current testing technologies and practices of participating states are being inventoried. This collected information will provide a baseline for improvement and may help identify practices with potential for success in other states.

INTEGRATING MATERIALS AND CONSTRUCTION PRACTICES (IMCP) MANUAL

The results of the MCO project will be compiled in a user-friendly reference manual. The manual will identify the focal properties of portland cement concrete and provide detailed information about the technologies and procedures used to test those properties and predict pavement performance.

A request for proposals has been developed and posted for an IMCP Manual technical editor. The technical editor will compile field data, state research and practices, and the suite of tests into a useful PCC paving field manual. Development of the manual will be funded through the PCC Center's federal appropriations. The anticipated date of publication is April 2005.

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PROJECT WEBSITE

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