The spirit of collaboration

Guiding the National CP Road Map Program

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National CP Road Map Program
Executive Committee Web Meeting
March 29, 2011
Meeting Agenda

• Update on the SCOR meeting presentation on the CP Road Map – Tom Cackler
• Update on TO #4 – Dale Harrington
• Briefing on TO #5 – Ahmad Ardani
• Discussion of TO #5 training topics for the TPF states – Tom Cackler
AASHTO Standing Committee on Research

• Met on March 22-23, 2011
• Washington, DC
• Sandra Larson presented on TPF 5(185) which supports the CP Road Map
• Current States: Iowa, Michigan, Mississippi, New York, Pennsylvania, Virginia
SCOR Meeting Recap

• The Road Map is a partnership that is working
• Shared informational packet including the briefing paper on the TPF
• Impact of the Road Map was communicated
“Moving Advancements into Practice”

MAP Brief 3-1:
Describing promising technologies that can be used now to enhance concrete paving practices.

SmartCure: An Integral Part of an Intelligent Construction System

Introduction
The SmartCure System is a new technology developed by the Federal Highway Administration that uses various measuring devices and computer software to provide continuous, real-time, and site-specific recommendations for concrete pavement curing. These recommendations are based on immediate ambient conditions including wind speed, relative humidity, air temperature, and concrete surface temperature, as well as user-defined thresholds (figure 1).

How SmartCure works
SmartCure measuring devices collect ambient weather conditions and concrete surface temperature at set time intervals (e.g., every 10 minutes) for as long as the software is set to run. This data is transferred to a laptop and stored in a computer software program. The software organizes the data and calculates evaporation rate, bleed rate, and set times. Measured and calculated data are organized and displayed by the software for easy viewing by any user. Threshold values for evaporation rate, temperature of the concrete, and air temperature are inputs to the software. The thresholds indicate critical conditions at which the risk for damage to the pavement is highest if improper curing methods are not followed. When any of the data is out of the measured or calculated range close to or above threshold values, the software alerts the user and generates recommendations for how to handle the risk.

Background on curing
Curing concrete is a vital step in the pavement construction process. Proper curing minimizes moisture loss from the surface of the pavement caused by evaporation and reduces thermal gradients, thus decreasing the

Figure 1. Schematic of SmartCure measuring devices in the field

MAP Brief 5-2:
Describing promising technologies that can be used now to enhance concrete paving practices.

Intelligent Compaction for Concrete Pavement Bases and Subbases

Introduction
Unfortunately, many concrete pavement failures in the United States are related to inadequate foundation layers, such as subgrades and aggregates in the natural subgrade and the subbase. One factor in foundation-related pavement failures is poor compaction practices. The use of conventional compaction machines, even when skillfully operated, cannot ensure uniform pavement foundation layer support conditions.

A relatively new “smart” technology—intelligent compaction (IC)—has the potential to significantly improve compaction processes with a near-continuous record of compaction data that can aid in controlling uniformity of support conditions.

Benefits of IC
The major potential benefits of IC can be categorized as follows:
• Improved uniformity through optimized compaction control
• Increased productivity (each pass is optimized; unnecessary passes are eliminated)
• Identification of non-compactable and unstable areas
• Continuous record of material-related stiffness parameter values
• Ultimately, reduced pavement failure and repair costs

What is IC?
Intelligent compaction (IC) technologies consist of machines-integrated sensors and control systems that provide a record of machine-ground interaction on an onboard display unit in real-time using global positioning systems (GPS). With feedback control and automatic adjustment of vibration amplitude, frequency, and duration during the compaction process, the technology is referred to as “intelligent” compaction.

Without the vibration feedback control system, the technology is commonly referred to as continuous compaction control (CCC).

Figure 1. Smooth drum roller equipped with onboard display unit
Update on TO #4: E-News Highlights

CP Road Map E-News January 2011

The CP Road Map E-News is the newsletter of the Long-Term Plan for Concrete Pavement Research and Technology (CP Road Map), a national research plan developed and jointly implemented by the concrete pavement stakeholder community. To find out more about the CP Road Map, or to get involved, contact Dale Harrington, dharrington@snyder-associates.com, 515-964-2020.

New Moving Advancements into Practice (MAP) Brief
Moving Advancements into Practice (MAP) Briefs describe promising research and technologies that can be used now to enhance concrete paving practices.

MAP Brief 3-1: SmartCure: An Integral Part of an Intelligent Construction System has recently been published under CP Road Map Track 3: High Speed Nondestructive Testing and Intelligent Construction. This MAP Brief provides the results of research in different curing solutions and their effects on concrete pavements.

Download MAP Brief 3-1 (849 kb pdf).

News from the Road
News from the Road highlights research around the country (and, in this issue, around the world) that is helping the concrete pavement community meet the research objectives outlined in the CP Road Map.

ACPA publishes mechanistic-empirical tie bar design approach for concrete pavements
The American Concrete Pavement Association (ACPA) recently published a report by Applied Research Associates that guides readers through a mechanistic-empirical (M-E) design process for tie bars at longitudinal joints. The method applies to pavements in which two, three, and four 12-ft-wide lanes are tied together and considers the effects of various subbase materials.

Click here to download the full report.

This project is meeting needs identified in CP Road Map Track 2: Performance-Based Design Guide for New and Rehabilitated Concrete Pavements.

Texas conducts evaluation of M-EPDG with TxDOT rigid pavement database
Efforts in Texas lead to the initiation of a pavement performance database. A Texas Department of Transportation research report documents efforts to assimilate performance information on 27 sections of pavement located throughout the state. The purpose of this work was to calibrate the M-E PDG punchout model. The results of this work suggest that Texas' existing pavement management information system (PMIS) data may be reporting the cause of punchouts incorrectly. This theory, as discussed by the report, is based on the discrepancy between M-E PDG predicted punchouts and actual punchouts by the PMIS.

Click here to access the report.

This work is meeting needs identified in CP Road Map Track 2: Performance-Based Design Guide for New and Rehabilitated Concrete Pavements.

Wisconsin research evaluates open-graded base course with doweled and non-doweled transverse joints
Recent research in Wisconsin evaluated the performance of doweled versus non-doweled pavement sections.

CP Road Map E-News February 2011

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New Moving Advancements into Practice (MAP) Brief
Moving Advancements into Practice (MAP) Briefs describe promising research and technologies that can be used now to enhance concrete paving practices.

MAP Brief 5-2: Intelligent Construction for Concrete Pavement Bases and Subbases has recently been published under CP Road Map Track 5: Concrete Pavement Equipment Automation and Advancements.

Download MAP Brief 5-2 (1.1 mb pdf).

News from the Road
News from the Road highlights research around the country that is helping the concrete pavement community meet the research objectives outlined in the CP Road Map.

There's an app for that...
The American Concrete Pavement Association continues to add to its online application library. An application for the design of a bonded concrete overlay over asphalt (BCOA) is now available.

To access this application, click here.

This work is contributing to research objectives outlined in CP Road Map Track 2: Performance-Based Design Guide for New and Rehabilitated Concrete Pavements.

Louisiana Transportation Research Center evaluates performance of polyurethane foam as a rehabilitation option
A recent Transportation Research Board (TRB) report titled Mitigating Transverse Joint Failure in Jointed Concrete Pavement with Polyurethane Foam documents research by the Louisiana Transportation Research Center that investigated an economical alternative for rehabilitation of severely faulted jointed concrete pavement. The report concludes that polyurethane foam injected under the slab can be a successful solution for the immediate treatment of faulting. The report warns, however, that load transfer at the joints is reduced because of the process required to install the foam.

Click here for more information and to obtain the report from TRB.

This project is contributing to research objectives outlined in CP Road Map Track 2: Performance-Based Design Guide for New and Rehabilitated Concrete Pavements.

FHWA publishes state-of-the-technology report on high-performance materials for highway applications
The Federal Highway Administration (FHWA) recently published Advanced High-Performance Materials for Highway Applications: A Report on the State of the Technology, a summary of non-structural construction materials that have potential for use in both new construction and rehabilitation of highways. The report is not concrete specific; however, it does include information on the use of innovative cements, aggregates, and mortars.
Refreshing the CP Road Map

• Team members
  ▪ Dale Harrington
  ▪ Rob Rasmussen
  ▪ Melisse Leopold

• Committee Members
  → NC²
    ▪ Tommy Nantung (Indiana)
    ▪ Tyson Rupnow (Louisiana)
    ▪ Brett Trautman (Missouri)
  → ACPA National/State Chapter Executives
  → FHWA
Update on TO #4

• Refreshing of the CP Road Map – Goals
  → Review existing documents
    • 400 pages and 250 problem statements
  → Reorganize to match current priorities
  → Reorganize to capture state of the practice
  → Conduct targeted stakeholder review
Update on TO #4

• Refreshing the CP Road Map – Approach
  → Review both documents for required changes
    • Reflect changes in tracks
    • Reflect changes in state of the practice
  → Incorporate track framework, white paper, and training content
Update on TO #4

• Refreshing the CP Road Map
  → Schedule
    • April – June 2011
  → Feedback/discussion from Executive Committee
Briefing on TO # 5

• Overview of Scope
  → Training for TPF member states
  → Communications/outreach activities
  → Executive Committee and Track Team support
CP Road Map Training Objectives

• Provide TPF member states with knowledge coming from national research

• Avoid duplication by coordination and integrating with other training opportunities

• Develop a training framework that addresses training needs in a comprehensive manner

• Develop partnerships with other sponsors of training for effectiveness and efficiency
Briefing on TO #5

• Schedule for training
  →Proposed completion on May 31, 2012
• Six workshops; one in each state
• Discuss interest in also offering webinars
TO # 5 Proposed Training Topics

- Integrated Pavement Solutions
- Concrete Overlays
- Surface Characteristics
- Pavement Preservation
- Pervious Concrete
- Integrated Materials & Construction Practices
- Roller Compacted Concrete
- Early Age Cracking
- Compass
- FHWA QC/QA course
Future Meeting Schedule

• Electronic Meetings
  → Proposed: September 6, 2011 at 10:00am CDT
  → Proposed: January 10, 2012 at 10:00 am CST

• Physical Meeting
  → Proposed: April 3, 2012 in Chicago
Integrated Pavement Solutions

- Cohesive training on cement-bound materials
  - New Concrete Pavements
  - Concrete Overlays
  - Pervious Concrete
  - Roller-Compacted Concrete
  - Cement-Treated Base
  - Full-Depth Reclamation
  - Cement–Modified Soils
  - Recycled Concrete Aggregate
  - Repair and Restoration
Concrete Overlays

- Project selection/scoping
- Cost and performance history
- Design and plan development
- Construction practices
- Traffic management
Pavement Surface Characteristics

• Optimizing surface performance
• Sources of tire/pavement noise
• How to mitigate tire/pavement noise
• Model specifications
Concrete Pavement Preservation

- Pavement evaluation
- Slab stabilization
- Partial depth repairs
- Full depth repairs
- Edge drains
- Load transfer
- Diamond grinding
- Joint resealing
Pervious Concrete

- Site selection and design
- Mixture proportioning
- Specifications
- QC/QA
- Maintenance
Integrated Materials and Construction Practices

- Basics of concrete pavement design
- Fundamentals of materials
- Hydration of concrete
- Critical properties
- Concrete mixtures
- Concrete placement and construction considerations
- QC/QA
- Troubleshooting
Roller Compacted Concrete

- RCC applications
- RCC properties and materials
- Mix proportions
- Design of RCC pavements
- RCC production
- Construction
- Troubleshooting
Early Age Cracking of Pavements

• Why concrete cracks
• Design considerations
• Material selection
• Construction practices
• How to treat cracked pavements
• Use of Hiperpav
Concrete Mix Design Using COMPASS

- Mix Performance Criteria
  → Available materials, climate, spec limits

- Optimized Gradation
  → Combining stockpiles for durable, workable, economical mixes

- Mix Proportioning
  → Going beyond ACI 211, water adjustments

- Mix Optimization
  → Multiple criteria including strength, cost
FHWA QC/QA

• Under development