National Training Update and Tech Transfer Products

National Concrete Consortium Meeting

Indianapolis, Indiana

April 26-28, 2011

CP Tech Center

10 E-News

CP ROAD MAP
shaping the future of concrete pavement

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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 on different deicing 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 per the PMIS.

Click here to access the report.

This work is meeting research needs identified inCP 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-dowled transverse joints

Recent research in Wisconsin evaluated the performance of doweled versus non-doweled pavement sections

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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 Compaction 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 applications 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 polyeurethane foam as a rehabilitation option

A recent Transportation Research Board (TRB) report titled *Mitigating Transverse Joint Faulting 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 7: High-Speed Construction and Rehabilitation.

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-traditional 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,

MAP Briefs

	TOPIC	TRACK ASSIGNMENT
Completed	COMPASS Mix Design and Analysis Tool	Track 1 – Mix Design
Completed	Durability PCC Pavements Subject to Ch Deicers	Track 1 – Mix Design
Completed	Two-Lift Concrete Paving	Tracks 8 – Long Life Pavements; 5 – Equipment Adv
Completed	Stringless Paving	Track 5 – Equipment Auto
Completed	Roller Compacted Concrete	Tracks 8 – Long Life; 5 – Equipment Adv
Completed	Diamond Grinding	Track 4 – Surface Characteristics
Completed	Effective Use of Nonwoven Geotextiles as Interlayers in Concrete Pavement	Track 7 – Rehab & Const
Completed	Smart Pavements (Smart Cure)	Track 10 – Pvmt Performance
Completed	Intelligent Compaction	Tracks 2 – Design; 3 – Non Destructive; 5 – Equipment Auto
Mar 2011	Effective Use of Fly Ash & Slag Cements	Track 7 – Rehab & Const
Apr 2011	Joint Deterioration	Tracks 6 – Joint Innovation; 8 – Long Life
May 2011	Pavement Preservation – New Partial Depth Patching	Track 7 – Rehab & Const
Jun 2011	Identifying and Avoiding Incompatible Combination of Concrete Materials	Track 1 – Mix Design

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MAP Briefs

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"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

JANUARY 2011

ROAD MAPTRACK 3
High-Speed Nondestructive Testing and Intelligent Construction Systems

PRIMARY SOURCE
SmartCure Practical Enhancements for Field Application
Ruiz, J. M., R. O. Rasmussen, J. C. Dick, S. I. Garber, and D. Jacobson
Transtec Final Report for FHWA project No. DTFH61-08-D-00034-T-9003, FHWA, 2011.

SPONSORS
Federal Highway Administration

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Moving Advancements into Practice (MAP) Briefs describe innovative research and promising technologies that can be used now to enhance concrete paving practices. MAP Brief 3-1 provides information relevant to Track 3 of the CP Road Map, High-Speed Nondestructive Testing and Intelligent Construction Systems.

The Long-Term Plan for Concrete Pavement Research and Technology (CP Road Map) is a national research plan developed and jointly implemented by the concrete pavement stakeholder community. Publications and other support services are provided by the Operations Support Group and funded by TPF-5(185).

MAP Brief 3-1 is available at: http://www.cproadmap.org/publications/MAPbrief3-1.pdf

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), job-specific concrete materials, and user-defined thresholds (figure 1).

How SmartCure works

SmartCure measuring devices collect ambient weather conditions and concrete surface temperatures at set time intervals (e.g., every two 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 higher if proper curing methods are not followed. When any of the data (i.e., measured or calculated) are close to or above threshold values, the software alerts the user and generates recommendations for how to handle that 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

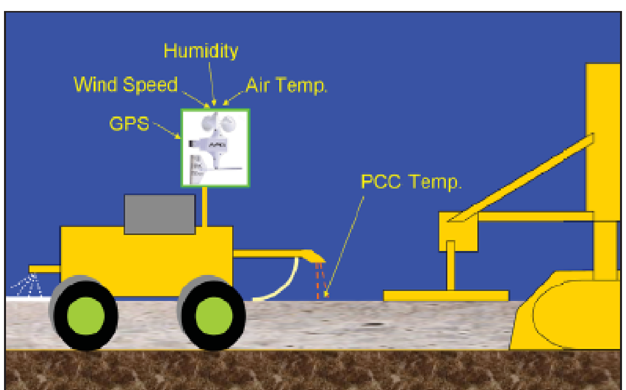

Figure 1. Schematic of SmartCure measuring devices in the field

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"Moving Advancements into Practice"

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

FEBRUARY 2011

ROAD MAPTRACK 5
Concrete Pavement Equipment Automation and Advancements

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SPONSORS
FHWA Pooled Fund TPF-5 (954)
NCHRP Project 21-09
Iowa DOT

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Moving Advancements into Practice (MAP) Briefs describe innovative research and promising technologies that can be used now to enhance concrete paving practices. MAP Brief 5-2 provides information relevant to Track 5 of the CP Road Map, Concrete Pavement Equipment Automation and Advancements.

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MAP Brief 5-2 is available at: http://www.cproadmap.org/publications/MAPbrief5-2.pdf

Introduction

Unfortunately, many concrete pavement failures in the United States are related to inadequate foundation layers—the soils and aggregates in the natural subgrade and in 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.

This MAP Brief provides a brief overview of IC technology, research, and implementation issues.

What is IC?

Intelligent compaction (IC) technologies consist of machine-integrated sensors and control systems that provide a record of machine-ground interaction on an on-board display unit in real-time using global positioning systems (GPS). With feedback control and automatic adjustment of vibration amplitude, frequency and/or speed 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).

Benefits of IC

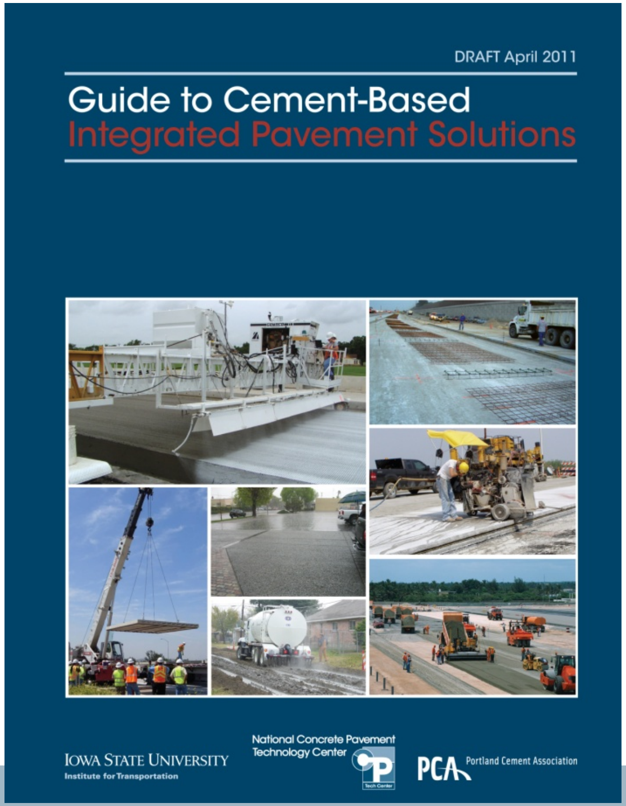
The major potential benefits of IC can be categorized as follows:

- 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

Figure 1. Smooth-drum roller equipped with onboard display unit

National Training – 10 Subjects
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



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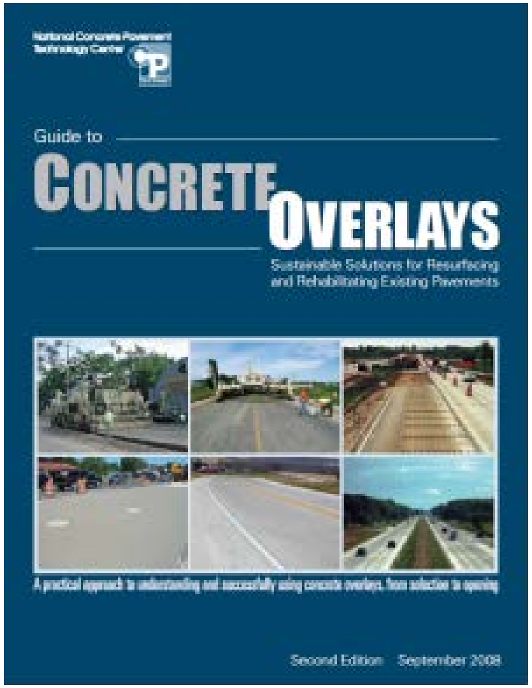
Concrete Overlays

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



Surface Characteristics

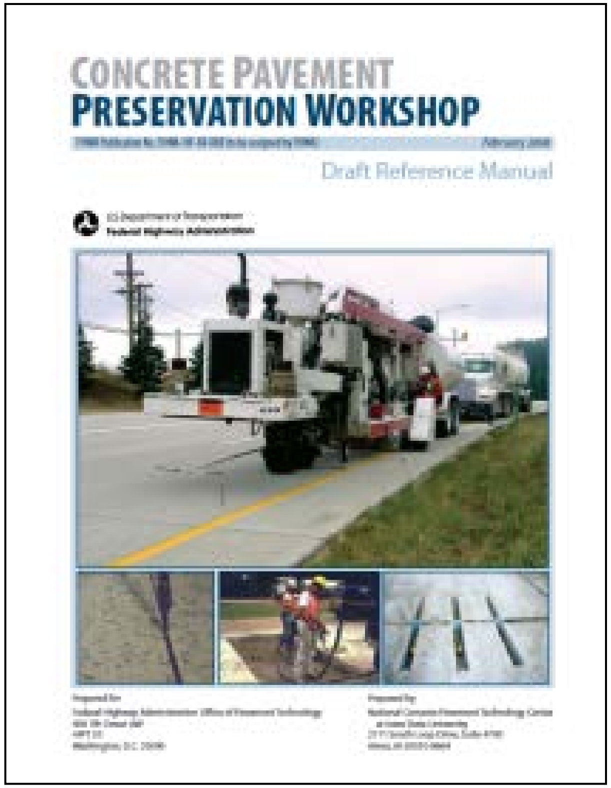
•Training and Communication

1. Technical Workshops (1 day)
   - Fundamentals (Noise/Texture 101)
   - How-to Guide
   - Model Specifications
   - Selecting the Right Texture
2. Webinars (3 × 90 min)
3. Upper Management Presentation (30 min)
4. Website (SurfaceCharacteristics.com)

Quiet Concrete Pavement

Concrete Pavement Preservation

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

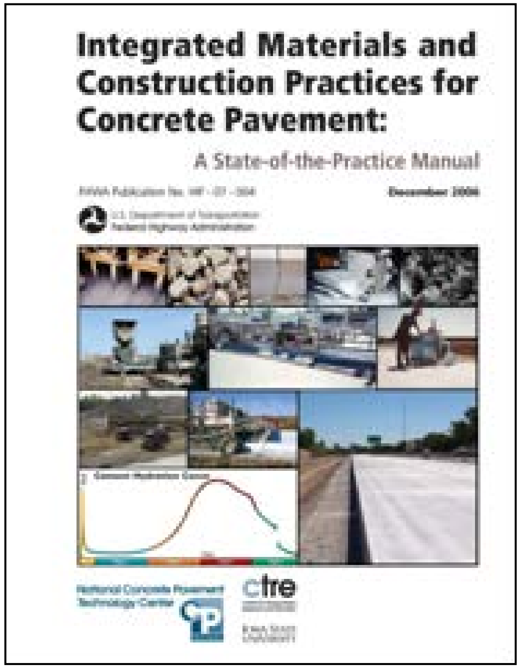


Pervious Concrete

- 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



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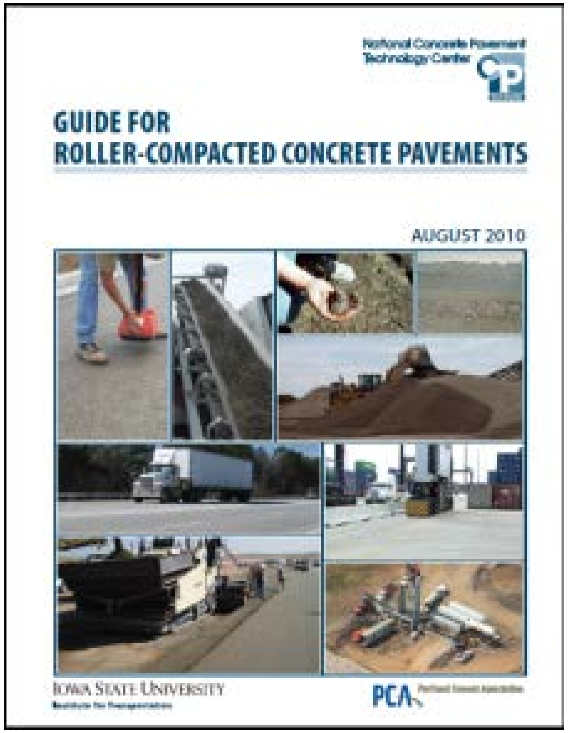
Roller Compacted Concrete

- RCC applications
- RCC properties and materials
- Mix proportions
- Design of RCC pavements
- RCC production
- Construction
- Troubleshooting



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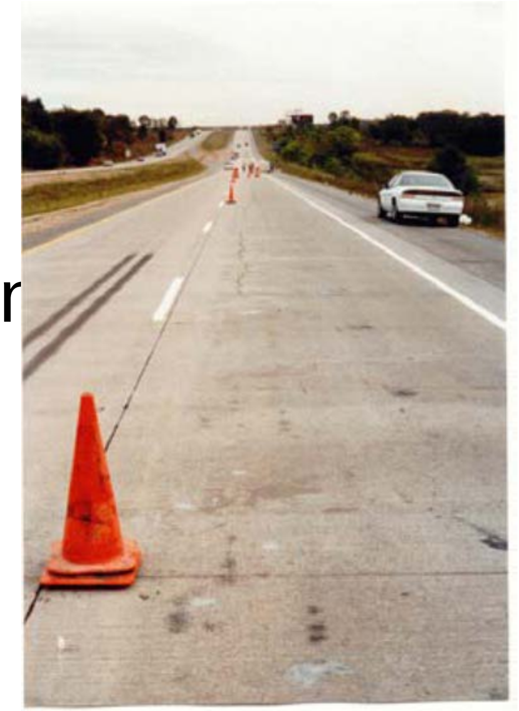
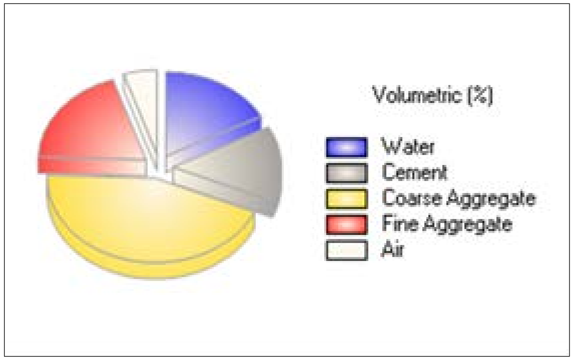
Early Age Cracking of Pavements

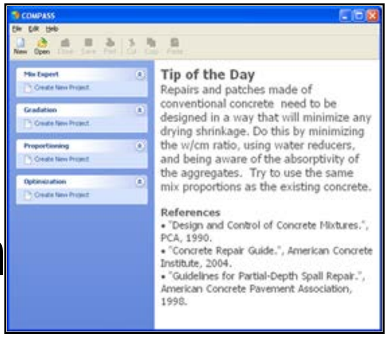
- Why concrete cracks
- Design considerations
- Material selection
- Construction practices
- How to treat cracked pavemen
- Use of Hiperpav



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 adjustm



- Mix Optimization
  - Multiple criteria including strength, cost

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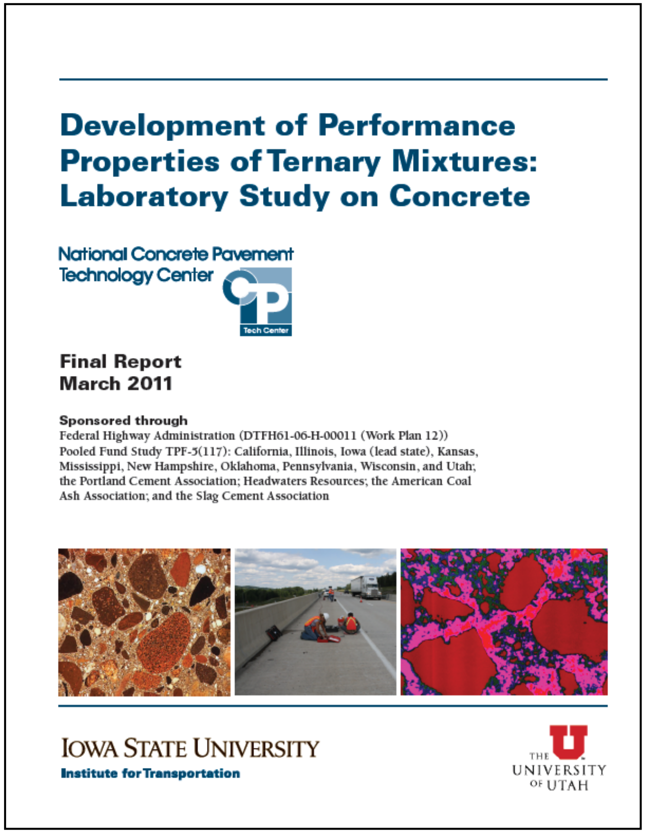
Recent Publications

- Properties of Ternary Mixtures
  - How supplementary (SCMs) can be used to improve the performance of concrete mixtures
  - Summarizes the findings of the Laboratory Study on Concrete
  - This phase of the research used an experimental matrix of 48 different mortar and concrete mixtures
  - Report contains test results from durability testing on mortar and concrete containing SCMs


Development of Performance Properties of Ternary Mixtures: Laboratory Study on Concrete

National Concrete Pavement Technology Center

Final Report
March 2011

Sponsored through
Federal Highway Administration (DTFH61-06-H-00011 (Work Plan 12))
Pooled Fund Study TPF-5(117): California, Illinois, Iowa (lead state), Kansas, Mississippi, New Hampshire, Oklahoma, Pennsylvania, Wisconsin, and Utah; the Portland Cement Association; Headwaters Resources; the American Coal Ash Association; and the Slag Cement Association

IOWA STATE UNIVERSITY
Institute for Transportation

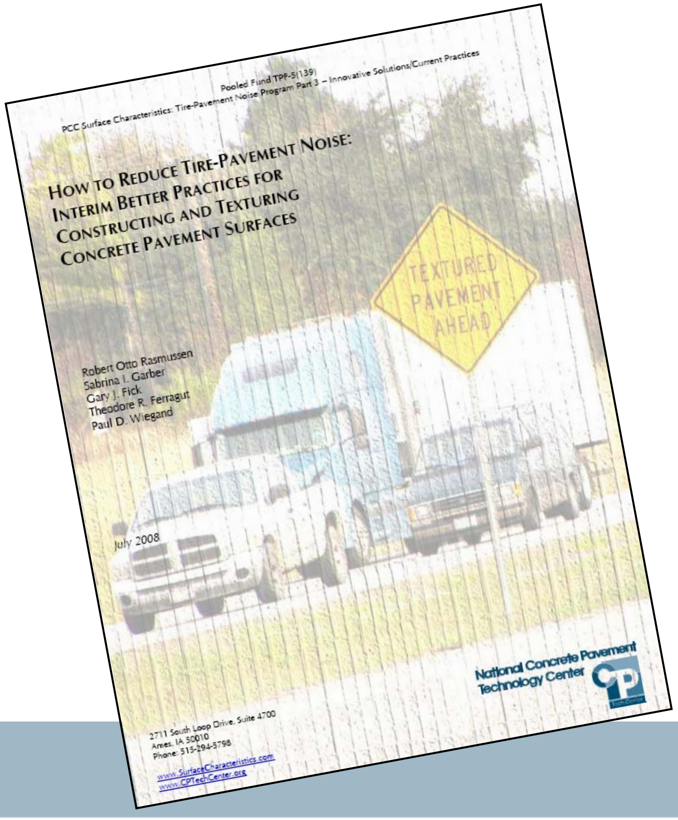
THE UNIVERSITY OF UTAH

Upcoming Publications

Surface Characteristics

•Flagship Products

1. How to Reduce Tire-Pavement Noise: Better Practices for Constructing and Texturing Concrete Pavement Surfaces


Pooled Fund TPF-5(139)
PCC Surface Characteristics: Tire-Pavement Noise Program Part 3 – Innovative Solutions/Current Practices

HOW TO REDUCE TIRE-PAVEMENT NOISE: INTERIM BETTER PRACTICES FOR CONSTRUCTING AND TEXTURING CONCRETE PAVEMENT SURFACES

Robert Otto Rasmussen
Sabrina I. Garber
Gary J. Fick
Theodore R. Ferragut
Paul D. Wiegand

July 2008

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www.SurfaceCharacteristics.com
www.CPTechCenter.org

National Concrete Pavement Technology Center

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Surface Characteristics

•Flagship Products

2. Model Specifications for Texture and Noise

> 2010 Special Provision
>
> The tire-pavement noise shall not exceed **X dBA** when measured by **Z procedure** at **D days** after opening to traffic.

Surface Characteristics

•Flagship Products

3. Guide for Selecting the Right Texture for the Right Situation

Function	Indicator	Description	Metric	1	2	3	4	5
FRICTION	FRICTION	This icon represents Friction. Measured per ASTM E 274 and ASTM E 524 and/or ASTM E 501.	SN40R	≥ 50	45-49	35-44	25-34	< 25
			SN40S	≥ 43	38-43	30-37	21-29	< 20
	TEXTURE	This icon represents Texture. Measured per ASTM E 1845.	MPD, in.	≥ 0.09	0.04-0.089	0.025-0.039	0.01-0.024	< 0.01
SMOOTHNESS	SMOOTHNESS	This icon represents Smoothness. Measured per ASTM E 1926 or AASHTO PP 37-4.	IRI, in /mi	≤30	31-60	60-120	120-200	>200
NOISE	INTERIOR VEHICLE NOISE TIRE/PAVEMENT NOISE	This icon represents In-Vehicle Noise. Four indicators are included: • In-vehicle noise level • Loudness level • Speech interference level • Articulation index Measured via OBSI.	In-vehicle A-weighted level, dBA Equivalent OBSI, dBA	≤64 ≤95	65-68 96-99	69-72 100-104	73-76 105-109	≥77 ≥110
			Loudness, sones Equivalent OBSI, dBA	≤20 ≤96	21-25 97-100	26-30 101-104	31-35 105-108	≥36 ≥109
			Speech interference level, SIL Equivalent OBSI, dBA	≤48 ≤96	49-51 97-99	52-54 100-103	55-57 104-106	≥58 ≥107
			Articulation Index, dBA range Equivalent OBSI, dBA	≤65 ≤96	66-69 97-100	70-72 101-104	73-75 105-108	≥76 ≥109
	WAYSIDE NOISE TIRE/PAVEMENT NOISE	This icon represents Wayside Noise. Measured via OBSI.	Statistical Passby Level (50 ft), dBA Equivalent OBSI, dBA	≤68 ≤96	69-72 97-100	73-76 101-104	77-80 105-108	≥81 ≥109

CP Tech Center

Surface Characteristics

•Tech Briefs

1. Diamond Grinding to Reduce Tire-Pavement Noise in Concrete Pavements
2. What Makes a Quieter Concrete Pavement?
3. The Language of Noise and Quieter Pavements
4. Measuring and Analyzing Pavement Texture
5. Tire-Pavement Noise Test Protocols
6. Variability of Pavements and Noise
7. Advanced Pavement Texture and Noise Specifications


TECH BRIEF

October 2010

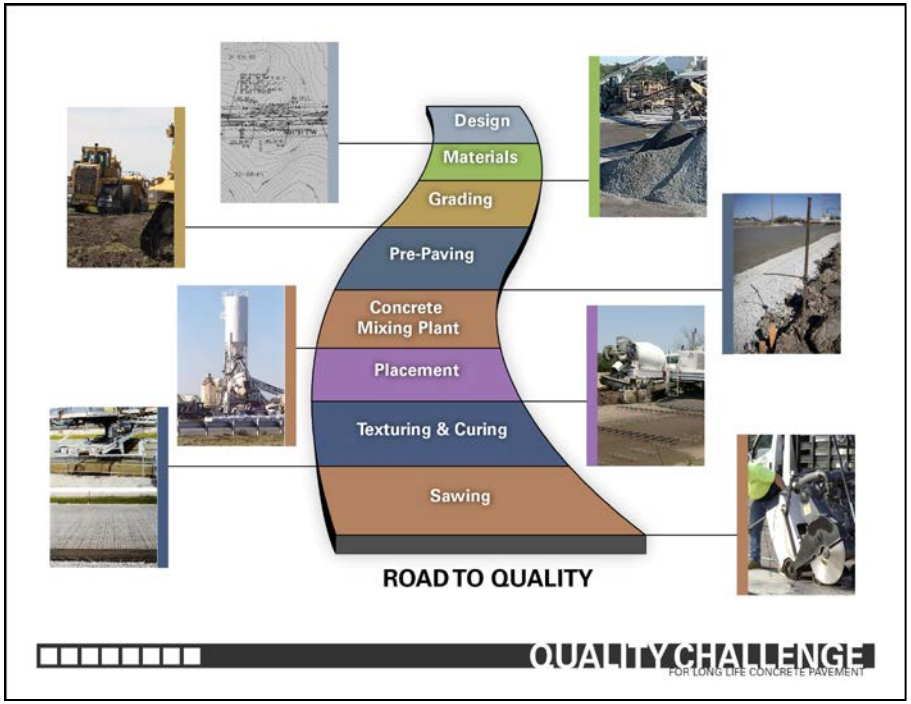
The Language of Noise and Quieter Pavements

Concrete Pavement Surface Characteristics Program

Upcoming Publications

2011 FHWA Quality Control

- Workshop Material
  - Participant's Workbook
  - Instructor Guide
  - Quality Guide (Inspector Guide)



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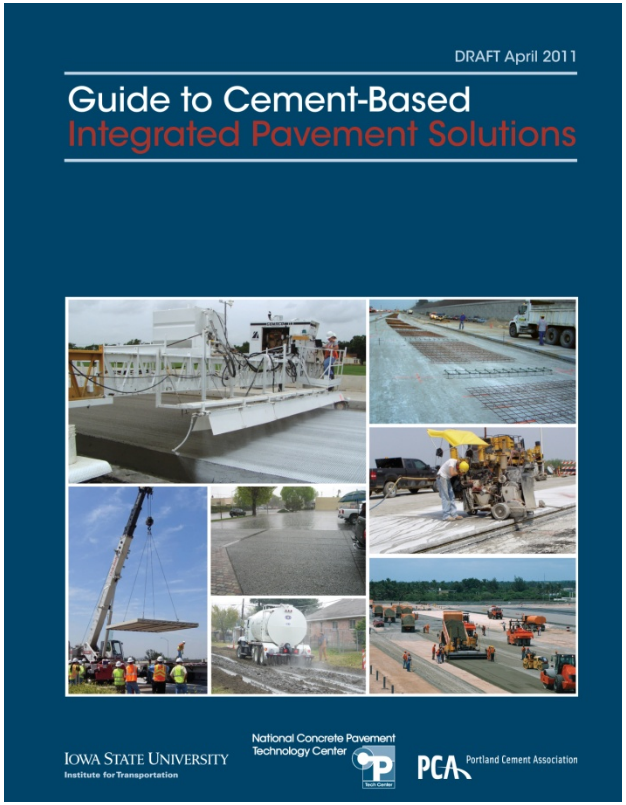
Upcoming Publications

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



Upcoming Publications

Sustainability Manual of Practice

- "Best Practices" manual to enhance concrete pavement sustainability
- Focus on practitioners
  - Decision makers, engineers, and contractors
- Manual will be part of an implementation package to expedite technology transfer
  - Workshop and web-based instruction

Upcoming Publications

Concrete Overlay Design Guide

- Develop Guide for Existing Concrete Overlay Design Methodology
  - To be completed in 2011
  - Evaluate 4 to 5 software programs, choose one to two for each type of Overlays carry forward and develop a number of examples.
  - Guide will be 40± pages
  - Tech brief summarizing software programs completed

Tech Center

Upcoming Publications

Partial Depth Repairs

- 15 Committee Members
  - 5 State DOTs
  - ACPA Chapters/National
  - FHWA
  - CP Tech Center
  - IGGA
  - Contractor
- Techniques & Sample Specifications on deep partial depth repairs
- To be ready in Summer of 2011