



## CP Road Map E-News June 2014

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 [Steve Klocke](#), 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.

The June 2014 MAP Brief, "[Constructing Concrete Pavements with Durable Joints](#)" describes some of the factors that may be contributing to the occurrence of joint deterioration and provides guidelines on how the risks may be reduced.

[Download the June 2014 MAP Brief.](#)



### 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.

### Minnesota Tests Drainage Properties of Fabric Interlayer for Unbonded Overlays

Fabric interlayers have been used for almost 30 years in Germany as bond breakers between cement-treated bases and jointed pavements to prevent reflective cracking and increase drainage. While concrete overlays have traditionally used a thin asphalt layer as the bond breaker, recent unbonded concrete overlay projects with a fabric interlayer have shown promising results. This research project tested the drainage capabilities of a fabric interlayer in an unbonded concrete overlay to determine whether the use of a fabric interlayer can provide the added benefit of increased drainage.



The lab test consisted of placing a fabric interlayer between a five-inch thick jointed base slab and a five-inch thick overlay slab. Testing was conducted to determine the flow rate of water draining through the fabric under both static and dynamic loads. The results of the testing showed that the interlayer exceeded the required permeability of the fabric under both static and dynamic loading conditions.

This project, "Drainage Capabilities of a Nonwoven Fabric Interlayer in an Unbonded Concrete Overlay," was completed for the Minnesota DOT at the University of Minnesota by Rita Lederle et al. [Click here to read the full report.](#)

This project is contributing to research objectives identified in CP Road Map [Track 8: Concrete Pavement Construction, Reconstruction, and Overlays.](#)

### Arizona DOT Targets Economical Concrete with Performance

## Specifications and Pay Factors

A recent report sponsored by the Arizona Department of Transportation highlights new aspects of materials science and structural mechanics in the development of sustainable “economical concrete.” The topics addressed in the report include blended cements, fiber-reinforced concrete (FRC), internal curing with lightweight aggregate, and statistical process control (SPC). The objective was to address new specifications, analysis, and design guidelines so that material models can be directly integrated into structural analysis software.

The report describes properties of pozzolans, blended cements, fly ashes, and other materials, along with proposed categories of high-performance concrete mixtures using high volume fly ash. Early-age cracking and drying shrinkage are addressed in detail as they both reduce load-carrying capacity and accelerate deterioration, resulting in increased maintenance costs and reduced service life. The report concludes with recommendations for performance-based specifications for quality assurance and introduces quality measures as criteria for reducing costs.

The project, “Economical Concrete Mix Design Utilizing Blended Cements, Performance-Based Specifications, and Pay Factors,” was completed for the Arizona DOT at Arizona State University by M. Bakhshi, B. Laungrungrong, A. Bonakdar, B. Mobasher, C. Borrer, and D. Montgomery. [Click here to read the full report.](#)

This project is contributing to research objectives identified in CP Road Map [Track 11: Concrete Pavement Economics and Business Management.](#)

## ESCSI Institute report recommends “Road Map for Internally Cured Concrete Pavement”

Internal curing is a relatively new technique being used to promote hydration of portland cement concrete. Saturated lightweight aggregate serves as a water reservoir within the concrete. Because the water in the aggregate is not free, it does not affect the water/cement ratio of the mix but is available to continue hydration as the slab dries out. While significant laboratory research has been completed, and a number of bridge decks have been constructed utilizing internal curing, this technology has only been utilized on a few pavement projects to date. These projects have shown excellent performance.



Structural longevity is improved with ICC due to its small reduction in unit weight, elastic modulus, and coefficient of expansion, along with a small increase in strength. When combined, these small improvements amount to a significant impact on slab fatigue damage and slab cracking. Likewise, durability is improved through moisture loss control and improved hydration. ICC shows a reduction in permeability, joint disintegration, and curling.

The Expanded Shale, Clay, and Slate Institute (ESCSI) has released a report that evaluates the potential for ICC in concrete pavement design and construction. The report also includes a “road map” for further evaluation and implementation of ICC into regular concrete pavement construction.

The report, “Evaluation of Internally Cured Concrete for Paving Applications” was prepared by Chetana Rao, Ph.D., and Michael Darter, Ph.D., P.E. with Applied Research Associates, Inc. and was sponsored by ESCSI. [Click here to read the complete report.](#)

This project is contributing to research objectives identified in CP Road Map [Track 1: Materials and Mixes for Concrete Pavements.](#)

## Preparing Concrete Surfaces Prior to Repairs and Overlays

The performance of a bonded concrete overlay relies heavily on the bond between the new overlay and old pavement. The biggest factor in developing this bond is preparation of the existing surface prior to overlay.

A manual issued by the U.S. Bureau of Reclamation in 2012 describes key factors in surface preparation.

The manual describes the mechanics of concrete bonding, explains the substrate conditions affecting bond strength, and provides suggested guide specifications that may be useful in the preparation of existing pavements prior to bonded overlays.

Report Number MERL 12-17, "Best Practices for Preparing Concrete Surfaces Prior to Repairs and Overlays" was prepared by Benoît Bissonnette, Alexander Vaysburd, and Kurt von Fay for the U.S. Department of the Interior. [Click here to read the complete report.](#)

This project is contributing to research objectives identified in CP Road Map [Track 8: Concrete Pavement Construction, Reconstruction, and Overlays.](#)

## Updates from the States: Pennsylvania

PennDOT understands the importance of research, education, and technology transfer activities as they relate to the transportation industry. PennDOT places a focus on research and innovation and realizes that the initial investment will pay great dividends in the future as research innovations drive change and/or business process improvements. For this reason, the Bureau of Planning and Research (BPR) manages and administers a customer-driven, applied Research Program focused on providing solutions to real-world transportation issues and challenges.



The mission of the PennDOT research program is to identify, develop, and conduct strategically focused research, education, and technology transfer projects. The mission is achieved through a contract research program that emphasizes applied research, implementation, performance monitoring, and technology transfer.

[Read on for more information about concrete pavement research in the State of Pennsylvania...](#)

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