Accelerating Infrastructure Innovations

FOCUS

June 2013

INSIDE

Bringing Asphalt Pavement Technology to Your Door

What can the Mobile Asphalt Testing Lab do for you?

Equipped with state-of-the-art testing equipment, the Federal Highway Administration's (FHWA) advanced asphalt lab on wheels offers State transportation agencies both onsite project support and access to today's innovative and emerging technologies. At the request of a State and with agreement from the asphalt contractor, the lab can travel to a project site and conduct a range of tests over a 2- to 3-week period to evaluate an asphalt mixture. These tests are conducted parallel with the contractor's quality control testing during real-time mixture production.

The lab's equipment includes the Asphalt Mixture Performance Tester, which measures the dynamic modulus, flow number, and fatigue properties of an asphalt mix, and the Aggregate Image Measurement System, which determines the shape, texture, and angularity of both fine and coarse aggregates.

While the contractor's or State's test results are still used for contract compliance, the mobile lab's tests offer an additional set of data with which to validate results, helping to

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FHWA's Mobile Asphalt Testing Lab offers States onsite project support and access to innovative technologies.

www.fhwa.dot.gov/publications/focus/index.cfm

U.S. Department of Transportation
Federal Highway Administration

Left: **Testing equipment available in FHWA's Mobile Asphalt Lab includes gyratory compactors.**

Above: **The Mobile Asphalt Lab can conduct a range of tests to evaluate an asphalt mixture, including using the Asphalt Mixture Performance Tester to measure the dynamic modulus, flow number, and fatigue properties of a mix.**

improve overall testing procedures and quality assurance practices.

Following each project, lab staff summarize the test results and materials performance. A final project report containing detailed documentation, results, and recommendations is provided to the State transportation agency.

The lab also offers assistance in validating equipment and using new materials and production techniques. Since FHWA launched the lab in 1993, it has been a vital resource in introducing States to such innovations as the Superpave mix design system, new asphalt binder modifiers, stone matrix asphalt, reclaimed asphalt pavement (RAP), warm mix asphalt (WMA), and reclaimed asphalt shingles, as well as new asphalt test specifications. These new test specifications include the Asphalt Mixture Performance Test and Multi Stress Creep and Recovery test protocols.

> "One of the Mobile Asphalt Testing Lab's greatest assets is its ability to introduce new technology into real-world construction."

"One of the Mobile Asphalt Testing Lab's greatest assets is its ability to introduce new technology into real-world construction," said Matthew Corrigan of FHWA. "Innovations continue to be implemented on site by the lab, including helping States combine asphalt technologies, such as using warm mix asphalt with reclaimed asphalt and shingles. While these combinations provide a challenge, the lab can help States successfully construct pavements that meet today's ever increasing demands."

Recent field visits made by the lab have included assisting with WMA projects in Colorado, Indiana, Missouri, and Pennsylvania, and aiding in implementation of high-percentage RAP projects in Delaware, Kansas, Minnesota, New Hampshire, and Wisconsin.

The lab has also provided assistance this year to researchers at the Texas Transportation Institute (TTI), conducting testing for National Cooperative Highway Research Program (NCHRP) projects 9-49 (Performance of WMA Technologies: Stage 1—Moisture Susceptibility) and 9-52 (Short-Term Laboratory Conditioning of Asphalt Mixtures). "The mobile lab allowed us to stretch our research dollars further, helping us obtain and collect samples and supporting the testing being done for the projects," said David Newcomb of TTI, principal investigator for NCHRP project 9-52. "The lab continues to be one of the most important tools in accelerating the implementation of good ideas. No other effort has come close in its ability to bridge research and practice."

Upcoming projects for 2013 will focus on using crumb rubber modified asphalt mixtures and reclaimed asphalt shingle modified mixtures.

For more information on the Mobile Asphalt Testing Lab's services, contact your FHWA division office or Matthew Corrigan at FHWA, 202-366-1549 (email: matthew.corrigan@dot.gov). *

Intelligent Compaction: The Smarter and More Efficient Way to Pave

Pave smarter, faster, and more efficiently with today's intelligent compaction (IC) roller technology.

IC technology provides instantaneous feedback to a roller operator on the stiffness of the material and where compaction has been applied. Some IC rollers can also provide a surface temperature profile for the material being compacted. This information can then be used by the roller operator to apply the right amount of compaction, at the right time, to achieve the specified material stiffness.

The Federal Highway Administration (FHWA) is promoting the deployment of IC technology through the second round of its Every Day Counts (EDC) program. Launched in 2010, EDC focuses on deploying innovations with proven benefits in shortening the time needed to complete highway projects. Many of the innovations offer additional benefits such as enhanced safety, improved quality, and reduced impact on the driving public.

IC technology uses an advanced dynamic evaluation device (accelerometer) positioned on or in roller drums to measure the response of the underlying paving materials to the compaction forces being applied by the drum. The accelerometer readings are then analyzed by an onboard computer that takes the readings, instantly calculates a stiffness value for the material being compacted, and provides the values in a graphical display to the operator. These values are also stored and can be downloaded either manually or wirelessly for use in a quality assurance program.

The rollers are equipped with global positioning system (GPS) technology that tracks the roller drum locations in real time. A color-coded display assists the roller operator in assuring that 100 percent of the pavement is being compacted. The onboard computer also links the stiffness value and other measures with the respective GPS location data to produce a complete map of the roller's operation. This information is provided back to the operator to help him or her make the necessary adjustments to assure quality in the compaction process.

Some IC rollers are also equipped with real-time surface temperature measuring and mapping equipment. Surface temperature data helps the roller operator apply compaction at the optimum temperature to achieve increased effectiveness and quality.

IC rollers can compact a greater amount of pavement with just enough passes to meet the specified stiffness, allowing transportation agencies and contractors to increase production while achieving time, cost, and fuel savings. Using IC rollers also improves the quality of compaction operations, resulting in longer-lasting pavements and reduced maintenance costs.

The technology is offered on both single-drum rollers for soil and aggregate base materials and double-drum rollers for asphalt pavement materials. IC technology can be purchased as standard equipment for new rollers. Retrofit kits are available for most existing equipment fleets. Improvements continue to be made to these kits.

FHWA's IC deployment initiative follows several years of collaborative work

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A thin lift of hot-mix asphalt is compacted with an intelligent compaction roller on U.S. 52 in West Lafayette, IN.

An intelligent compaction roller is used to place a hot-mix asphalt lift on U.S. 219 in Springville, NY.

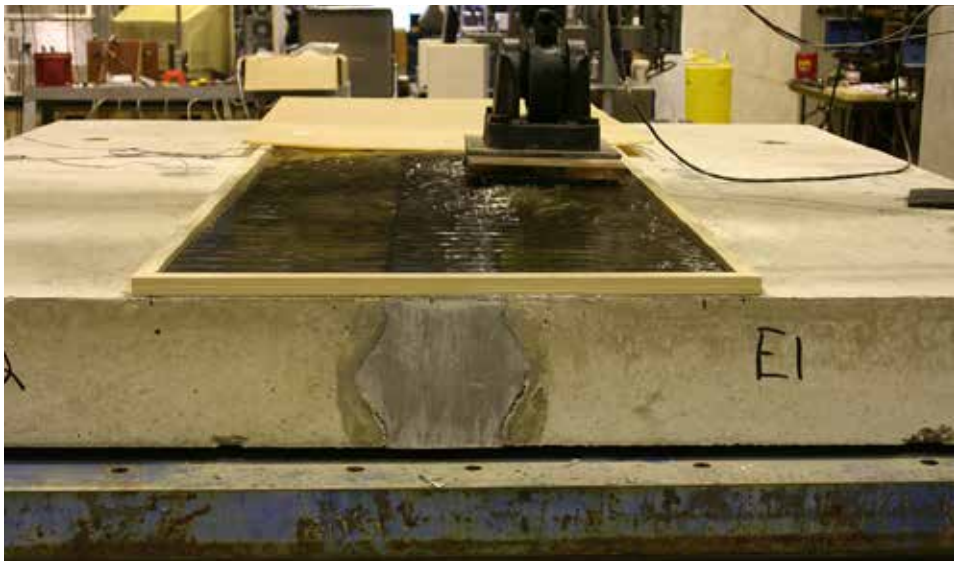
Designing a Better Bridge with Ultra-High Performance Concrete

Accelerated project completion and ultra-high performance. Learn how to combine these project goals while renewing your bridge infrastructure with a new Federal Highway Administration (FHWA) publication, *Design Guide for Precast UHPC Waffle Deck Panel System Including Connections.* The guide takes users through the design and construction of a precast ultra-high performance concrete (UHPC) waffle deck bridge.

As States contend with aging infrastructure and growing traffic volumes, they have increasingly turned to accelerated bridge construction (ABC) techniques using prefabricated bridge elements. These prefabricated elements, ranging from superstructures or substructures to totally prefabricated bridges, offer both faster and safer bridge construction and better quality. ABC techniques can also reduce costs and the environmental impact of projects.

States have faced challenges, however, with the connections used between precast bridge deck panels, including such problems as cracking and poor construction. UHPC can improve these connections and eliminate conflict points. As demonstrated in bridge projects in States such as Iowa and New York, UHPC exhibits superior properties, including exceptional durability, high compressive strength, and long-term stability.

Through a project awarded to Coreslab Structures, Inc., by FHWA's Highways for LIFE Technology Partnership program, researchers at Iowa State University combined the advantages of UHPC and precast deck systems to develop a prefabricated UHPC waffle deck system with field-cast UHPC connections. Following a full-scale validation test under laboratory conditions, the waffle deck system was successfully installed on a two-lane, single-span bridge in Wapello County, Iowa, in 2012. To make the UHPC waffle deck panels fully composite with the prestressed concrete girders, three different connections were used: shear pocket, longitudinal, and transverse.



Ultra-high performance concrete (UHPC) can improve the connections used to link bridge girders to precast concrete bridge decks. Here, UHPC connections are tested at FHWA's Turner-Fairbank Highway Research Center in McLean, VA.

UHPC exhibits superior properties, including exceptional durability, high compressive strength, and long-term stability.

Using lessons from the Iowa project, the design guide introduces UHPC and its application in the waffle deck system. The guide covers the waffle deck panel design, panel-to-panel connection details and panel-to-girder connection details, and the use of a UHPC waffle deck in a deck replacement project. Also covered are prefabrication, construction, and installation, including formwork, casting the UHPC waffle panel, and curing of the panel. An Appendix features the design drawings for the Wapello County UHPC bridge project.

The guide will be available online in mid June. For additional information, visit www.fhwa.dot.gov/hfl. Learn more about the design guide by participating in a free FHWA Webinar to be held June 25, 2013, from 2:30 to 4 p.m. For registration information on "UHPC for Precast Bridge Decks and Connections," visit www.nhi.fhwa.dot.gov/resources/webconference/web_conf_learner_reg.aspx?webconfid=25391. For more information on the design guide, contact Ben Graybeal at FHWA, 202-493-3122 (email: benjamin.graybeal@dot.gov). *

An Online Introduction to Drilled Shaft Inspection

A new Web tutorial offered by the Federal Highway Administration's (FHWA) National Highway Institute (NHI) introduces Federal, State, and local highway agency employees and consultant personnel to the fundamental concepts needed to inspect drilled shaft construction.

The 4-hour training, Drilled Shaft Inspector Tutorial (Course No. FHWA-NHI-132070B), covers the inspector's work prior, during, and after completion of the drilled shaft construction process, including documents and tools required for inspection and equipment and site checks. Focus areas include the inspector's roles, functions, and responsibilities at different phases of construction. Also addressed are theoretical and actual calculation of drilled shaft concrete volumes and post-installation, load, and integrity tests.

NHI recommends completing the tutorial before attending the instructor-led course, Drilled Shaft Foundation Inspection (Course No. FHWA-NHI-132070). This 2.5-day course provides a basis for local, regional, or national qualification of drilled shaft inspectors. The goal of the course is to provide inspectors with practical knowledge and standard industry practices for the inspection of drilled shaft foundation construction. The training follows recommended FHWA specifications and practices for drilled shaft foundation construction, but may be modified to follow local agency specifications and practices. The course fee is $680 per person.

Learn more about FHWA's Geotechnical Engineering resources by visiting www.fhwa.dot.gov/engineering/geotech.

> The 4-hour training covers the inspector's work prior, during, and after completion of the drilled shaft construction process.

For more information on taking the tutorial or scheduling the instructor-led course, visit www.nhi.fhwa.dot.gov and select "Search for a Course." For questions on the tutorial and course content, contact Justice Maswoswe at the FHWA Resource Center, 410-962-2460 (email: justice.maswoswe@dot.gov).

To learn more about FHWA's Geotechnical Engineering resources, visit www.fhwa.dot.gov/engineering/geotech. Topic areas include earth and rock works, earth retaining structures, geotechnical hazards, ground improvement, structural foundations, and subsurface investigation. Featured resources range from details on conferences, Webinars, and training opportunities to copies of FHWA publications and guidance memos. Also included are links to other useful geotechnical resources. ✻

Infrastructure Innovation Webinars

These free Webinars provide a quick introduction to the latest infrastructure innovations and technologies.

Know the Risks: Geotechnical Assets Are Key to Improving Performance
June 24, 2013, 2–3:30 p.m.
(eastern daylight time)

Sponsored by the Federal Highway Administration (FHWA) and American Association of State Highway and Transportation Officials (AASHTO), the Webinar will examine the role of geotechnical assets in the performance of transportation systems. Participants will learn how to consider risk and implement asset plans designed to improve performance. Case studies will highlight steps State transportation departments and Federal agencies are taking to manage their geotechnical assets.

The Webinar will feature case studies from Colorado and Yosemite National Park, as well as discussion of retaining wall management programs and geotechnical asset management of mechanically stabilized earth walls.

No registration is required. To join the Webinar, call 866-299-7945 (enter "3450166" as the participant passcode) and log into www.livemeeting.com/cc/icollaboration/join?id=TAMWebinar&role=attend. After the Webinar, a recording and presentations will be available at http://tam.transportation.org.

Ultra-High Performance Concrete (UHPC) for Precast Bridge Decks and Connections: Design Guide, Construction Experience, and Owner Perspective
June 25, 2013, 2:30–4:00 p.m.
(eastern daylight time)

The session will provide an overview of UHPC and its use in precast bridge deck panels and connections, as well as an open discussion time where participants can ask questions. Twenty roadway bridges built with UHPC components are open to traffic today in the United States, and many more are on the way. A UHPC design guide to be released by FHWA in June will assist States in deploying the technology.

The Webinar is sponsored by FHWA's Highways for LIFE program. Registration information will be available by mid June at www.fhwa.dot.gov/hfl/innovations/uhpc_design.cfm.

More information about the Asset Management Book Club is available at www.fhwa.dot.gov/asset/bookclub.cfm.

Asset Management Book Club

All Webinars are from 2–3:30 p.m. (eastern daylight time).

June 26, 2013—Enabling Processes and Tools for Life-Cycle Management and Asset Preservation (Chapter 6 of *Transportation Asset Management Guide)*

July 24, 2013—Enabling Processes and Tools for Transportation Asset Management Integration (Chapter 7 of *Transportation Asset Management Guide*)

August 28, 2013—Information Systems and Data (Chapter 8 and Appendix E of *Transportation Asset Management Guide*)

September 25, 2013—Bringing It All Together and Moving Forward (Appendix D of *Transportation Asset Management Guide*)

In 2011 AASHTO published the *Transportation Asset Management Guide: A Focus on Implementation,* which encourages transportation agencies to use asset management principles. Sponsored by FHWA and AASHTO, this Webinar series will review the content of the guide and share experiences from practitioners. To register, visit www.fhwa.dot.gov/asset/bookclub.cfm. Advance registration is required for each individual Webinar. For additional information, contact Nastaran Saadatmand at FHWA, 202–366–1337 (email: nastaran.saadatmand@dot.gov). *

Highway Technology Calendar

The following events provide opportunities to learn more about products and technologies for accelerating infrastructure innovations.

Fiftieth Annual Petersen Asphalt Research Conference
July 15–17, 2013, Laramie, WY

Organized by the Western Research Institute (WRI), the conference presents current research aimed at understanding and improving asphalt performance. Topics range from fundamental compositional research to applied field engineering. Participants are invited to take part in an open mic discussion.

Contact: Steve Salmans at WRI, 307-721-2306 (email: ssalmans@uwyo.edu), or Jack Youtcheff at the Federal Highway Administration (FHWA), 202-493-3090 (email: jack.youtcheff@dot.gov). Information is also available at www.petersenasphaltconference.org.

2013 Pavement Performance Prediction Symposium
July 18, 2013, Laramie, WY

Presented by WRI in cooperation with FHWA's Turner-Fairbank Highway Research Center, the symposium will focus on "Innovations and Issues in Pavement Preservation and Durability." The symposium includes time for questions and open discussion.

Contact: Steve Salmans at WRI, 307-721-2306 (email: ssalmans@uwyo.edu), or Jack Youtcheff at FHWA, 202-493-3090 (email: jack.youtcheff@dot.gov). More information is available at www.petersenasphaltconference.org.

Transportation Research Board (TRB) 93rd Annual Meeting
January 12–16, 2014, Washington, DC

Transportation professionals from around the world will gather to share perspectives on current developments in transportation research, policy, and practice. The conference will feature more than 4,000 presentations in nearly 750 sessions and workshops. The spotlight theme for 2014 is "Celebrating Our Legacy, Anticipating Our Future."

Contact: For information, visit the TRB Web site at www.trb.org (click on "Annual Meeting"). Questions about the meeting can be emailed to trbmeetings@nas.edu.

2014 Design-Build in Transportation Conference
March 19–21, 2014, San Jose, CA

Join transportation leaders in discussing lessons learned in the use of the design-build project delivery method for transportation projects. Topics will include choosing the right delivery method, contracting approaches, innovative financing solutions, risk allocation, and performance contracting.

Contact: Jerry Yakowenko at FHWA, 202-366-1562 (email: gerald.yakowenko@dot.gov), or visit www.dbtranspo.com.

Tenth National Conference on Transportation Asset Management
April 28–30, 2014, Miami, FL

The conference is designed for transportation agencies and metropolitan planning organizations in all stages of asset management implementation. Themes will include establishment and monitoring of asset management plans, performance measures for asset management, tools and technology to assist decisionmaking, and adaptation to extreme weather events and climate change, including using risk assessment and vulnerability analysis. Asset management initiatives of the Moving Ahead for Progress in the 21st Century Act will also be discussed.

Contact: To learn more, visit www.trb.org/conferences/AssetManagement2014.aspx.

FOCUS

Focus (ISSN 1060-6637), which is published monthly by the U.S. Department of Transportation's Federal Highway Administration (FHWA), covers the implementation of innovative technologies in all areas of infrastructure.

Its primary mission is twofold: (1) to serve the providers of highway infrastructure with innovations and support to improve the quality, safety, and service of our roads and bridges; and (2) to help promote and market programs and projects of the various offices of FHWA's Office of Infrastructure.

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Intelligent Compaction,
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with State transportation agencies, contractors, and equipment manufacturers to refine and demonstrate the technology through field projects, training sessions, and open houses. In 2011, FHWA completed a 3-year transportation pooled fund study, "Accelerated Implementation of Intelligent Compaction Technology for Embankment Subgrade Soils, Aggregate Base, and Asphalt Pavement Materials" (Project No. TPF-5(128)). As part of this study, 16 IC demonstrations were conducted in 13 States.

Since 2007, FHWA has funded research on the use of IC for quality control testing. State partners have included Utah and Florida, with testing also scheduled in Ohio, California, and Maine this summer. The study on "Intelligent Compaction Density Evaluations of Hot-Mix Asphalt Pavements" is scheduled to be completed in 2014. "While no conclusions have been reached yet on using IC for acceptance testing, the research is reinforcing the value of using IC for quality control during construction," said Richard Duval of FHWA.

FHWA's Federal Lands Highway Division office is currently using IC rollers for a 14-km (8.7-mi) roadway rehabilitation project on U.S. Highway 82 in New Mexico's Lincoln National Forest. The rollers are being used on both the full-depth reclamation base layer and the hot-mix asphalt pavement. "Even though it is early in the project, the information we are receiving from the IC rollers is helping our roller operators complete the compaction of both the subgrade and asphalt. We have seen increased coverage consistency and an overall improvement with roller activities," said Dan Lurtsema of project contractor Mesa Verde Enterprises. To date, the precision of the GPS data has been good. To learn more about the project, contact Mike Voth at FHWA, 720-963-3505 (email: michael.voth@dot.gov).

Following FHWA's implementation initiative and demonstration projects, many contractors have purchased IC rollers and are now using them to accelerate construction and decrease fuel consumption.

To learn more about IC and the many implementation resources available, including generic specifications, technical briefs, and training opportunities, visit www.fhwa.dot.gov/everydaycounts or www.intelligentcompaction.com. Information is also available by contacting Antonio Nieves at FHWA, 202-366-4597 (email: antonio.nieves@dot.gov). Additional details on the IC process can be found in the April 2008, April 2010, July 2011, and July 2012 issues of *Focus* (to view back issues of *Focus* online, visit www.fhwa.dot.gov/publications/focus/past.cfm). ✻