Accelerating Infrastructure Innovations

FOCUS

August 2011

INSIDE

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U.S. Department of Transportation
Federal Highway Administration

A Data-Driven Approach to Inspection: FHWA Introduces New Bridge Safety Initiative

A new bridge safety initiative introduced by the Federal Highway Administration (FHWA) this year is using systematic, data-driven, and risk-based reviews and analysis to improve oversight of how States are performing their bridge inspections. This new process will help identify opportunities for improvement in achieving consistent compliance with the National Bridge Inspection Standards (NBIS).

The initiative replaces FHWA's prior National Bridge Inspection Program oversight practices and the annual NBIS compliance reviews conducted by FHWA's State division offices. Previously FHWA division offices prepared an annual written assessment of a State's bridge inspection program based on a general review of key inspection areas. Using the new process, FHWA is assessing bridges using defined criteria for 23 key metrics, each of which can be linked directly to requirements in the NBIS. These key metrics include inspection records; determination of bridge load limits; qualifications of inspection personnel; procedures for underwater, fracture-critical, and complex bridge inspections; and inspection frequency.

The new process is based on objective, statistical data, providing for greater consistency in bridge inspections nationwide and more strategic approaches to identifying problem areas. "It allows us to hone in on areas that need the most improvement, raising the bar in terms of bringing all programs to a level meeting or exceeding national standards," said Tom Everett of FHWA. "We will be better able to target areas of concern."

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A primary difference from past inspection oversight practices is that instead of determining an overall

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Bridge inspectors examine the strands of a suspension cable.

Expanded FHWA Hydraulics Laboratory to Conduct Major New Bridge Scour Studies

The recent expansion of the Federal Highway Administration's (FHWA) J. Sterling Jones Hydraulics Laboratory is enabling major new research studies on bridge scour, which will result in new and improved design equations and procedures.

Scour—the erosion of stream bed material around bridge foundations—is the leading cause of bridge failures in the United States. An analysis of bridge failure statistics for 12 States conducted by the New York State Department of Transportation found that 60 percent of the recorded bridge failures between 1966 and 2005 were the result of scour.

Located at FHWA's Turner-Fairbank Highway Research Center in McLean, Virginia, the expanded laboratory features the first high-speed sediment recirculation flume in the United States. Designed after the only existing high-speed flume in Auckland, New Zealand, and donated to the laboratory by the Florida Department of Transportation, the flume can be used to conduct live bed scour tests. These tests simulate the movement of river bed material in water flowing upstream of a river crossing. Prior to the installation of the new flume, research could only be conducted on the more rare occurrence of clear water scour, where there is no movement of river bed material.

"The new flume provides FHWA with a huge opportunity to conduct tests that are closer to actual field situations and expand the state of the knowledge," said Kornel Kerenyi of FHWA. "This will result in more accurate design methods and procedures."

Composed of several sections, including a sediment catch basin and a diffuser to return the water flow, the flume can be tilted and sediment recirculated. The flume's footprint is 33 m (110 ft) long x 3 m (10 ft) wide x 3 m (10 ft) high, while the main channel of the flume is 1 m (3.28 ft) wide.

Originally built in 1984 to study hydraulic flow and its effects on highway bridges, culverts, and storm inlets, FHWA's Hydraulics Laboratory modified its existing tilting flume in the late 1980s to study bridge scour hydraulics, following the 1987 failure of the Schoharie Creek I-90 Bridge in New York.

Planned new research studies that will use the high-speed sediment recirculation flume include an examination of pressure flow scour under live bed conditions. The study will also look at the influence of bridge piers on pressure flow, with the aim of developing new design equations on pressure flow scour to replace those currently found in FHWA's Hydraulic Engineering Circular No. 18 (HEC-18), *Evaluating Scour at Bridges.* This circular contains the standard guidance on bridge scour.

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> "The new flume provides FHWA with a huge opportunity to conduct tests that are closer to actual field situations and expand the state of the knowledge."

Left: FHWA's new high-speed sediment recirculation flume, prior to installation.

Above: The J. Sterling Jones Hydraulics Laboratory at FHWA's Turner-Fairbank Highway Research Center in McLean, VA.

Ready, Set, Go: FHWA's Online Maintenance Training Series

It's training at your convenience. Ready to go at the time and place that best suits your schedule, the Federal Highway Administration's (FHWA) free online Maintenance Training Series covers topics ranging from pavement preservation concepts to weather-related operations to the practicalities of work-zone traffic control. Each of the 11 self-paced training courses takes approximately 1 hour to complete.

"The Maintenance Training Series was created to respond to the needs of those individuals responsible for the maintenance of the Nation's infrastructure. The series allows them to access the training they need, any time and any where," notes Christopher Newman of FHWA.

Participants are encouraged to register for the entire series (Course No. FHWA-NHI-134109), so that they can access all 11 training courses. However, those interested in specific training that fits their needs can also register for courses individually.

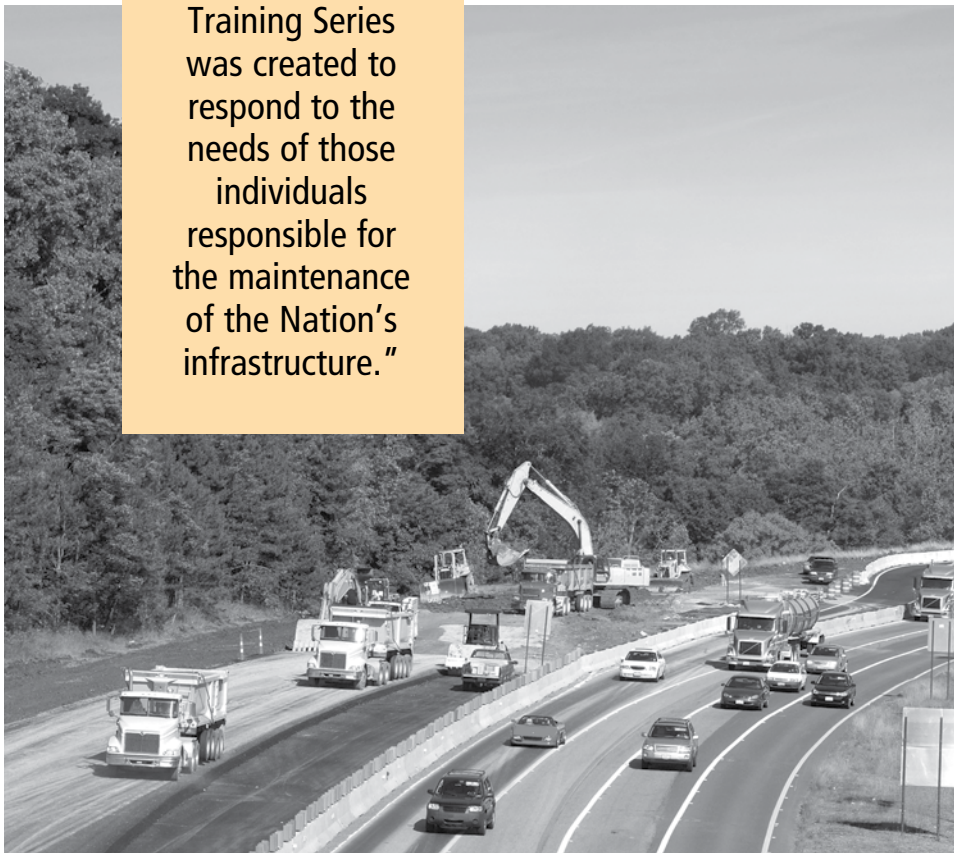
Training modules included in the series are:

- Pavement Preservation Programs (Course No. FHWA-NHI-134109A)
- Shoulders and Shaping (Course No. FHWA-NHI-134109B)
- Thin HMA [Hot-Mix Asphalt] Overlays and Leveling (Course No. FHWA-NHI-134109C)
- Base and Subbase Stabilization and Repair (Course No. FHWA-NHI-134109D)
- Drainage (Course No. FHWA-NHI-134109E)
- Outdoor Advertising and Litter Control (Course No. FHWA-NHI-134109F)
- Roadside Vegetation Management (Course No. FHWA-NHI-134109G)
- Weather-Related Operations (Course No. FHWA-NHI-134109H)
- Basics of Work-Zone Traffic Control (Course No. FHWA-NHI-134109I)
- Underground Storage Tanks (Course No. FHWA-NHI-134109J)
- Cultural and Historic Preservation (Course No. FHWA-NHI-134109K)

The courses are designed for State, county, or regional agency personnel who manage transportation maintenance and operations programs and handle oversight, quality assurance, materials, scheduling, budgeting, or planning.

For more information on the Maintenance Training Series or to register, visit www.nhi.fhwa.dot.gov (click on "Register for a Course"). Information on the series is also available by contacting Christopher Newman at FHWA, 202-366-2023 (email: christopher.newman@fhwa.dot.gov). *

"The Maintenance Training Series was created to respond to the needs of those individuals responsible for the maintenance of the Nation's infrastructure."



FHWA's free online Maintenance Training Series features 11 self-paced courses on a range of highway maintenance topics.

New FHWA Tech Briefs Offer Information on Superpave Gyratory Compaction

As part of its ongoing national effort to improve the long-term performance and cost effectiveness of asphalt pavements, the Federal Highway Administration's (FHWA) Asphalt Pavement Technology Program has released two new Tech Briefs on the Superpave mix design system.

Superpave Mix Design and Gyratory Compaction Levels (Pub. No. FHWA-HIF-11-031) highlights the revolution in mix design brought about by the Superpave system. Developed through the Strategic Highway Research Program (SHRP) and first launched in 1993, Superpave is now the most widely used mix design system in the United States. The system introduced a new compactor, the Superpave gyratory compactor (SGC), for densifying mixes in the lab. Also introduced were new aggregate and binder requirements.

Despite Superpave's widespread success, some highway agencies have expressed concern that the asphalt mixes produced by the system's gyratory compaction levels can be too dry due to low asphalt binder content, resulting in durability issues. As noted in the Tech Brief, "the AASHTO [American Association of State Highway and Transportation Officials] Superpave gyratory compaction levels have proven to provide good-performing, constructible pavements in most cases." For cases where the current requirements may not be effective, the FHWA Mix Expert Task Group recommends that agencies perform an independent evaluation prior to making any adjustments in compaction levels from the AASHTO R 35 standards, "Superpave Volumetric Design for Hot-Mix Asphalt." The evaluation should look at the effect of the proposed changes in gyration level on performance for typical aggregates, binder, and mix designs. *Superpave Mix Design* provides guidance on conducting these evaluations, including examining the gyratory compaction level and binder content, considering the relationship of aggregate material properties to performance, evaluating mixtures, and conducting performance testing.

An overview of the gyratory issues that affect the performance of asphalt pavements is provided in *Superpave Gyratory Compactors* (Pub. No. FHWA-HIF-11-032). As highlighted in the Tech Brief, the primary operating parameters for the SGC include the pressure applied to the specimen during compaction, speed of gyration/rotation, number of gyrations applied to the specimen, and the angle of gyration. Values for these parameters were established during the development of the Superpave system under SHRP.

When all of these factors are properly calibrated, it was generally assumed that an SGC would produce hot-mix asphalt (HMA) specimens that have similar volumetric properties. However, this assumption has been questioned in recent years since procedures for calibrating the angle of gyration are unique to specific models of SGCs. FHWA led an effort to develop technology for a universal method of measuring the angle of gyration on all SGCs from inside of the specimen mold. These "internal angle" measurement devices have since been refined and are available from private manufacturers. As there are numerous potential sources of variability related to the production of a laboratory-compacted HMA specimen, however, *Superpave Gyratory Compactors* is designed to help practitioners address all of these various sources. The publication also provides a brief history of the development of concepts, practices, and equipment for measuring the internal angle of gyration, as well as the development of specifications for using internal angle measurements as part of routine practice.

Topics covered include use of the dynamic internal angle to calibrate the SGC, measurement of the dynamic internal angle using simulated loading, comparison of internal angle measurement systems, and the relationship between the internal angle and air voids for compacted HMA.

To download the Tech Briefs online, visit www.fhwa.dot.gov/pavement/pub_listing.cfm (click on "S" to see links to the publications).

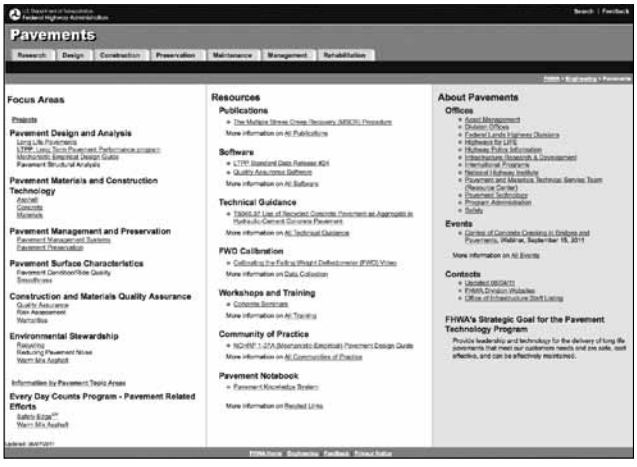
For more information on the Superpave mix design system, contact the FHWA Asphalt Pavement Technology Team:

John Bukowski, 202-366-1287
(email: john.bukowski@fhwa.dot.gov).

Jack Youtcheff, 202-493-3090
(email: jack.youtcheff@fhwa.dot.gov)

Tom Harman, 410-962-0134
(email: tom.harman@fhwa.dot.gov)

To learn more about additional pavement topics, visit www.fhwa.dot.gov/pavement. *



Information on the Superpave mix design system and other pavement topics is available at www.fhwa.dot.gov/pavement.

Webinar to Present Expert Guidance on Controlling Concrete Cracking

Learn from experts nationwide by participating in the upcoming Webinar, "Control of Concrete Cracking in Bridges and Pavements," scheduled for September 15, 2011, from 2:30 to 4 p.m. (eastern daylight time). Cosponsored by the Federal Highway Administration (FHWA) and the Transportation Research Board (TRB), the Webinar is part of the ongoing Innovations series, which is designed to bring representatives from State and local transportation agencies, industry, academia, and others timely information on today's highway technology advances. This series is hosted by FHWA's National Highway Institute (NHI), in conjunction with the FHWA Highways for LIFE program.

Mechanical loading, environmental factors, and such harmful reactions as sulfate attack, corrosion of reinforcing steel, and alkali-aggregate reaction can all result in the development of tensile stresses in concrete. These stresses frequently result in cracking, both in the early stages of construction and during the concrete's service life. As the Webinar will explore, the potential for cracking can be minimized by taking certain precautions in design, materials selection, and construction practices, thus extending the life of the pavement or bridge.

The Webinar is based on *Control of Cracking in Concrete: State of the Art*, a circular published by TRB's Committee AFN10, Basic Research and Emerging Technologies Related to Concrete. Topics covered will include:

- Causes of concrete cracking.
- Testing and detecting cracks.
- Controlling cracking.
- Practices to prevent cracks.

Among the featured speakers are representatives from Purdue University, University of Kansas, and the New York State Department of Transportation.

More information and a link for registration will be available in August at www.fhwa.dot.gov/hfl (click on "Communications"). ✻

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Subscribe to NHI Training Updates

Customize your email updates on courses and other training resources from the Federal Highway Administration's (FHWA) National Highway Institute (NHI) with new email subscription options. Starting this month, subscribers can sign up for training announcements based on their specific interests, such as session locations, free Webinars, and course subject areas. Also available are subscriptions to the NHI Newsletter.

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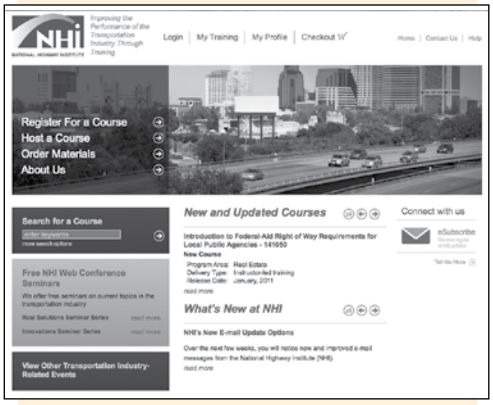

Highway Technology Calendar

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

Second International Conference on Warm Mix Asphalt
October 11–13, 2011, St. Louis, MO

Sponsored by the National Asphalt Pavement Association and the Federal Highway Administration (FHWA), the conference will provide a progress report on the implementation of warm-mix asphalt. Featured topics will include mix design, long-term performance, accelerated performance testing, effects on binder properties, and innovative temperature reduction processes. The conference will be of interest to engineers, researchers, contractors, and transportation agency personnel.

Contact: Matthew Corrigan at FHWA, 202-366-1549 (email: matthew.corrigan@fhwa.dot.gov), or visit www.warmmixasphalt.com.

Precast/Prestressed Concrete Institute 57th Annual Convention and National Bridge Conference
October 22–26, 2011, Salt Lake City, UT

Focusing on the theme "Shape Your Future," attendees will learn about new products and technologies and expand their knowledge of precast concrete structures. Event cosponsors include FHWA.

Contact: Raj Ailaney at FHWA, 202-366-6749 (email: raj.ailaney@fhwa.dot.gov), or visit http://pciconvention.org/2011/index.html.

Fifth Asphalt Shingle Recycling Forum
October 27–28, 2011, Dallas, TX

Organized by the Construction Materials Recycling Association, the forum will cover all aspects of the opportunities offered by shingle recycling. Using recycled asphalt shingles in hot-mix asphalt and other construction applications can save money and conserve natural resources while maintaining quality.

Contact: Audrey Copeland at FHWA, 202-493-3097 (email: audrey.copeland@fhwa.dot.gov), or visit www.shinglerecycling.org.

National Bridge Management, Inspection, and Preservation Conference
October 31–November 4, 2011, St. Louis, MO

Building upon FHWA's successful 2007 National Bridge Preservation Workshop, the conference will feature separate tracks for bridge management, inspection, and preservation topics. "Making the Case for Bridge Preservation" and "Next Generation Bridge Inspection" will also be featured themes. The conference is sponsored by FHWA and the American Association of State Highway and Transportation Officials' (AASHTO) Transportation System Preservation Technical Services Program (TSP•2).

Contact: Shyan-Yung Pan at FHWA, 202-366-1567 (email: shyan.pan@fhwa.dot.gov). Information is also available at www.TSP2.org/bridge.

Industrial Byproducts Conference
November 1–2, 2011, Austin, TX

Sponsored by FHWA, the Industrial Resources Council, and the Rubber Manufacturers Association, the conference will highlight the use of industrial byproducts in road construction.

Contact: Jason Harrington at FHWA, 202-366-1576 (email: jason.harrington@fhwa.dot.gov), or visit www.RMA.org.

Second Road Dust Best Management Practices Conference
November 7–9, 2011, Las Vegas, NV

Best practices in road dust management and lessons learned will be featured at the conference, which addresses environmental compatibility and sustainability, general and international best practices, and unique and extreme conditions. Sponsors include Montana State University; the University of Nevada, Las Vegas; Transportation Research Board (TRB); and FHWA.

Contact: For more information, visit http://roaddustinstitute.org/conference.

TRB 91st Annual Meeting
January 22–26, 2012, Washington, DC

More than 10,000 transportation professionals from around the world will gather at the meeting to share perspectives on current developments in transportation research, policy, and practice.

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.

Ninth National Conference on Transportation Asset Management: Making Asset Management Work in Your Organization
April 16–18, 2012, San Diego, CA

Sponsored by TRB, AASHTO, and FHWA, conference topics will include asset management implementation, pavements and bridges, beyond pavements and bridges, and transit state of good repair. Abstracts for conference presentation proposals are being accepted until September 15, 2011.

Contact: To learn more, visit www.trb.org/conferences/assetmanagement2012.

Seventh RILEM International Conference on Cracking in Pavements
June 20–22, 2012, Delft, Netherlands

Conference topics will include the detection, prediction, and mitigation of cracking in pavements; laboratory and field model validation; and accelerated pavement testing. Organized by RILEM (the International Union of Laboratories and Experts in Construction Materials, Systems, and Structures), conference partners include FHWA and AASHTO.

Contact: Katherine Petros at FHWA, 202-493-3154 (email: katherine.petros@fhwa.dot.gov), or visit www.rilem2012.org.

International Conference on Long-Life Concrete Pavements
September 18–21, 2012, Seattle, WA

Organized by FHWA, in partnership with the National Concrete Pavement Technology Center, the conference will address various aspects of concrete pavement design, construction, and materials technologies that result in long-life, sustainable concrete pavements. Abstracts for conference presentation proposals are due by October 1, 2011.

Contact: Shiraz Tayabji at Fugro Consultants, Inc., 410-997-9020 (email: stayabji@aol.com), or Sam Tyson at FHWA, 202-366-1326 (email: sam.tyson@fhwa.dot.gov). Conference information is also available at www.fhwa.dot.gov/pavement/concrete/2012conf.cfm. *

New Bridge Safety Initiative,

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level of compliance for a State, FHWA will make an individual compliance determination for each of the 23 metrics. Each metric will be assessed at different levels (minimum, intermediate, and indepth) based on associated risk and the duration between more detailed FHWA reviews.

"The reviews now underway are already demonstrating the effectiveness of the new system," said Everett.

For more information about the new bridge safety initiative, contact Tom Everett at FHWA, 202-366-4675 (email: thomas.everett@fhwa.dot.gov). *

Top: A bridge in North Carolina is inspected using under-bridge inspection vehicles.

Bottom: An inspector conducts a visual inspection of a single-span bridge in Missouri.

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FHWA Hydraulics Laboratory,

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Another planned study will look at combined pier and pressure flow scour for live bed and clear water conditions. The study's goal is to develop new design equations for inclusion in the next edition of HEC-18.

For more information about the high-speed sediment recirculation flume or the work of FHWA's Hydraulics Laboratory, contact Kornel Kerenyi at FHWA, 202-493-3142 (email: kornel.kerenyi@fhwa.dot.gov). Information on the laboratory is also available at www.fhwa.dot.gov/research/tfhrc/labs/hydraulics. To download a copy of HEC-18, visit www.fhwa.dot.gov/engineering/hydraulics/library_listing.cfm. *

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