FHWA R&T Now

A news update of research, technology, and development from the U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA)

January/February 2015

GENERAL/ADMINISTRATIVE

FHWA Participates in ATTRI Outreach and Stakeholder Meetings

The Federal Highway Administration (FHWA) and the Federal Transit Administration are co-leaders of the Accessible Transportation Technologies Research Initiative (ATTRI), which aims to enable independent mobility of travelers with disabilities through the use of intelligent transportation systems (ITS) and other innovative technologies.

Supported by the ITS Joint Program Office and the National Institute on Disability and Rehabilitation Research, the initiative focuses on the needs of three stakeholder groups: people with disabilities, veterans, and older adults. Targeting four functional disabilities—visual, hearing, cognitive, and mobility—ATTRI is working to develop technological solutions to remove barriers to mobility and independent travel.

In November, ATTRI representatives participated in meetings with members of the National Robotics Initiative; the Interagency Committee on Disability Research (ICDR) and Department of Labor; the ICDR/Interagency Committee on Assistive Technology; and Autonomous Robotics for Installation and Base Operations. In December, representatives from ATTRI met with Toyota.

To improve mobility and independent travel, ATTRI solutions will leverage advances in vehicle- and infrastructure-based technologies, automation, robotics, and wireless communication. ATTRI will focus on the following five technology areas: wayfinding and navigation; assistive technologies; automation and robotics; data integration; and enhanced human service transportation. In fiscal year 2015, ATTRI will be requesting information about potential applications in these areas for further development.

To leverage technologies and innovations from Federal ITS and related disability research and development, ATTRI works cooperatively with research partners such as ICDR; the U.S. Army Tank Automotive Research, Development and Engineering Center; the U.S. Access Board, and other public and private organizations.

For more information, contact Mohammed Yousuf, 202-493-3199, mohammed.yousuf@dot.gov.

INFRASTRUCTURE

LTPP Builds Its First Warm-Mix Asphalt Project

FHWA initiated a new Specific Pavement Study (SPS) for monitoring the performance of warm mix

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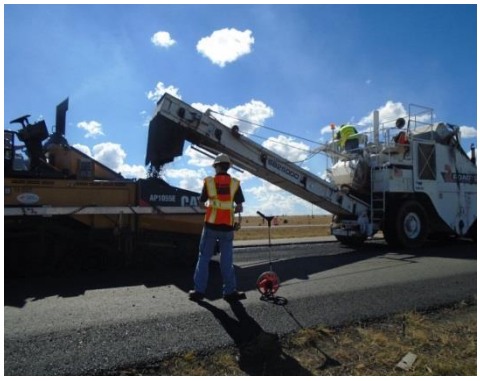
technology under the Long-Term Pavement Performance (LTPP) Program. The SPS-10 experiment, "Warm Mix Asphalt Overlay of Asphalt Pavement Study," aims to compare the performance of warm mix asphalt (WMA) to hot mix asphalt (HMA), both in the short- and long-term. The study will shorten the current knowledge gap between the performance of WMA and HMA. FHWA is accepting nominations for sites from States.

The SPS-10 experiment is designed to explore how a set of primary factors influence pavement performance. These factors include: the type of WMA technology used, the climatic elements of temperature and moisture, and traffic loading. The SPS-10 projects are overlays of existing asphalt pavement. Each project consists of 500 foot test sections with different overlay properties. Projects are required to have three core sections: HMA control, WMA produced using a foaming process, and WMA produced using a chemical additive. For the purpose of this study, WMA is defined as asphalt pavement produced at 30 degrees Fahrenheit below standard HMA production temperatures or below 275 degrees Fahrenheit.

In addition to the core sections, State departments of transportation may choose to include supplemental sections in order perform additional research relative to their own network. For example, a State may decide to study the effects of increased recycled asphalt pavement content, decreased overlay thickness, or other WMA production methods. All materials testing and performance monitoring related to the supplement sections will be performed by the LTPP team at no cost to the State.



The first SPS-10 project was constructed in the fall of 2014 along westbound Interstate 40 in central New Mexico, near Santa Rosa in Guadalupe County. The project included the three core sections as well as two supplemental sections selected by the New Mexico Department of Transportation.

For more information, contact Jack Springer, 202-493-3144, jack.springer@dot.gov.

LTPP InfoPave™ 2015 Released at TRB Meeting

In January 2015, at the 94th TRB Annual Meeting, the LTPP program launched the 2015 LTPP InfoPave™ Web portal. First released in January 2014, LTPP InfoPave allows users to easily tap into the wealth of pavement data available from the LTPP program. It also offers findings from data analyses and extensive documentation for the many aspects of LTPP experimental designs, data acquisition, quality control, and data dissemination.

To reach out to users of the pavement engineering community, the LTPP team formed an LTPP InfoPave Champions group, which consists of representatives from academia, industry, and the private sector research community (stakeholders who stand to gain the

most from the Web-based system). Based on inputs from the InfoPave Champions group as well as other users, the 2015 improved version features many enhancements, including:

- Topic-specific visual data selection.
- Improved filters for identifying LTPP test sections of interest.
- Section timeline that includes major construction events and monitoring actions.
- Visualization of the pavement layer properties and distress data over time.
- Access to the C-LTPP data.
- Interactive LTPP Data Analysis Strategic plan and research reports.
- Enhanced presentation of LTPP documents, tools, and media.

For more information, contact Aramis López, 202-493-3145, aramis.lopez@dot.gov.

Researchers Complete Forensic Investigation, Present Results

Researchers at TFHRC have completed a forensic study into the cause of slippery conditions on an asphalt ultra-thin bonded wearing course. On December 3, 2014, Terry Arnold and Nelson Gibson of FHWA's Office of Infrastructure Research and Development presented findings to the Great Smoky Mountains National Park Service (GSMNPS). Those attending included Alan Sumeriski, GSMNPS Chief of Maintenance; Clay Johnson, GSMNPS Acting Chief Ranger; and Laurin Lineman, Director of Project Delivery for Eastern Federal Lands.

The research showed that the operational deficiency was a result of the aggregate properties as well as the application of an excessive amount of tack coat. Although the aggregate had passed the Micro-Deval abrasion test, the study determined the aggregate exhibited a propensity for polishing.

For more information, contact Jack Youtcheff, 202-493-3090, jack.youtcheff@dot.gov.

FHWA Discusses UHPC Connections at DDOT Workshop

On December 18, 2014, Ben Graybeal, who heads FHWA's Structural Concrete Research Program, conducted a workshop for the District of Columbia Department of Transportation (DDOT). Requested through DDOT's local division office, the workshop focused on ultra-high performance concrete (UHPC) connections for prefabricated bridge elements. Graybeal delivered a hands-on presentation, introducing the technology, discussing lessons learned, and demonstrating common entry points deployed by departments of transportation over the past decade.

About 25 individuals attended, including the designer and general contractor for a project aimed at redecking the 16th Street Bridge over Military Road. Currently underway, the work will feature accelerated bridge construction methods and use prefabricated superstructure units. The plan had been to use conventional grouted deck-level connections, but the bridge owner is now considering a revised connection detail that uses UHPC technology, offering the benefits of simpler fabrication and construction, as well as enhanced long-term performance. DDOT learned about the benefits of using UHPC technology at an Every Day Counts summit in October.

For more information, contact Ben Graybeal, 202-493-3122, benjamin.graybeal@dot.gov.

Technical Brief: Nondestructive Inspection Protocol for Reinforced Concrete Barriers

This technical brief summarizes a response to a recommendation from the National Transportation Safety Board to "expand the research and development of nondestructive evaluation technologies to develop bridge inspection methods that augment visual inspections; offer reliable measurement techniques; and are practical, both in terms of time and cost, for field inspection work; and promote the use of these technologies by bridge owners."

Researchers considered four nondestructive evaluation technologies, including ground-penetrating radar, low-frequency ultrasonic tomography, infrared thermography, and digital radiography. They conducted laboratory testing on two concrete barrier configurations used in the Washington, DC, metropolitan area: the F-shape bolt down barrier and the New Jersey free standing portable barrier.

This document is available at www.fhwa.dot.gov/publications/research/infrastructure/structures/14071/index.cfm. For more information, contact Hamid Ghasemi, 202-493-3042, hamid.ghasemi@dot.gov.

Technical Note: Design and Construction of Field-Cast UHPC Connections

Ultra-high performance concrete (UHPC) exhibits mechanical and durability properties that make it an ideal candidate for use in developing new solutions to pressing concerns about highway infrastructure deterioration, repair, and replacement. Field-cast UHPC details connecting prefabricated structural elements used for bridge construction have proven to be an application that has captured the attention of owners, specifiers, and contractors across the country. These connections can be simpler to construct and can provide more robust long-term performance than connections constructed through conventional methods.

This technical note provides guidance on the design and deployment of field-cast UHPC connections. It covers common UHPC connection concepts; design of field-cast UHPC connection details; material and construction specifications; construction engineer inspection; and a case study featuring the construction of I-81 bridges in Syracuse, NY.

This document is available to download at www.fhwa.dot.gov/publications/research/infrastructure/structures/14084/index.cfm. For more information, contact Ben Graybeal, 202-493-3122, benjamin.graybeal@dot.gov.

Report: The Use of Phosphoric Acid to Stiffen Hot Mix Asphalt Binders

Phosphoric acid exists in different strengths or concentrations, with physical forms ranging from a clear odorless colorless liquid or a transparent solid, depending on the concentration and temperature. This report offers guidelines for the use of phosphoric acid to stiffen asphalt binders for hot mix paving applications. Phosphoric acid can be used in different ways to modify asphalt binders. It is used as an additive to increase the high temperature performance grade. It can also be used to reduce the amount of styrene butadiene styrene polymer needed to meet the Strategic Highway Research Program Superpave Plus specifications, especially for binders that are marginal on the rolling thin film oven test. Dispersion of some polymers in asphalt can be facilitated by the addition of phosphoric acid. The guidelines in this report will be useful to producers of asphalt binders, hot mix paving contractors, State departments of transportation, and local highway agencies.

The document is available at www.fhwa.dot.gov/publications/research/infrastructure/pavements/14086/index.cfm. For more information, contact Terry Arnold, 202-493-3305, terry.arnold@dot.gov.

SAFETY

FHWA Hosts NCUTCD at Turner-Fairbank

On January 9, 2015, the Human Factors Team in FHWA's Office of Safety Research and Development hosted the National Committee on Uniform Traffic Control Devices (NCUTCD) at the Turner-Fairbank Highway Research Center in McLean, VA. This biennial meeting brought together more than 50 individuals from local and Federal agencies, academia, and industry. It included presentations from FHWA staff on research activities, including FHWA Traffic Control Device Pooled Fund Study projects. Following the presentations, attendees were offered tours of the Human Factor's Highway

Driving Simulator, Field Research Vehicle, MiniSimTM, Sign Lab, and the Saxton Transportation Operations Laboratory. These laboratories have all seen significant upgrades since NCUTCD's last visit in 2012.

NCUTCD assists in the development of standards, guides, and warrants for traffic control devices and helps develop practices used to regulate, warn, and guide traffic on streets and highways. NCUTCD provides recommendations to FHWA and other appropriate agencies on proposed revisions and interpretations to the Manual on Uniform Traffic Control Devices (MUTCD) and other accepted national standards.

NCUTCD also develops public and professional awareness of the principles of safe traffic control devices and practices and provides a forum for qualified individuals with diverse backgrounds and viewpoints to exchange professional information.

For more information, contact Jim Shurbutt, 202-493-3420, jim.shurbutt@dot.gov.

OPERATIONS

FHWA Displays Research Vehicle at TRB Annual Meeting

FHWA's Office of Operations Research and Development (R&D) recently displayed a vehicle from its research fleet at the Transportation Research Board's (TRB) Annual Meeting in Washington, DC. One of five Cadillac SRX Crossover vehicles, the vehicle is equipped with a technology platform to guide connected automation research over the next 5 to 10 years.

The platform enables fully automatic control of acceleration and braking, with the flexibility to support steering controls for future connected automation research. The platform provides researcher-friendly access to longitudinal control of the vehicle and manufacturer-equipped sensors, and it supports software development with common tools such as MathWorks Simulink and MATLAB. In addition, the platform supports vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications using dedicated short-range communications and cellular communications.

Cooperative Adaptive Cruise Control (CACC) is the first operational concept to be tested using the five-vehicle fleet. Researchers will leverage the longitudinal control capabilities and a data elements library provided by the platform to deliver and implement speed and torque commands. The vehicles will also use V2V communications to share speed, heading, location, and gap information to achieve smoother operation in a five-vehicle platoon. The resulting CACC functionality of the research vehicles can be leveraged by future projects to study additional operational, connected vehicle, and automation concepts and applications.

For more information, contact Taylor Lochrane, 202-493-3293, taylor.lochrane@dot.gov.

FHWA Initiates Next Phase of Speed Harmonization Research

During the summer of 2014, FHWA's Office of Operations R&D led a speed harmonization field test with three vehicles in live traffic. Speed harmonization is an infrastructure-to-vehicle communications method by which speeds of vehicles approaching a bottleneck are slightly decreased in order to smooth traffic flow, reduce stop and go traffic, and slow the onset of major congestion.

Under a new project, "Speed Harmonization Fundamental Research," researchers will build on experiences and lessons learned from the field test. The objective of the task is to develop new speed harmonization concepts for testing and identify ancillary technologies required for testing. The new speed harmonization concepts will demonstrate that vehicles can safely operate in an automated fashion to provide cooperative speed harmonization and provide insight into the potential performance benefits if more vehicles are equipped with automated longitudinal control.

In order to accomplish these objectives, the team will revise the speed harmonization algorithms developed for the field test and conduct additional testing using FHWA's five-vehicle research fleet. Testing phases will include: closed-course verification at TFHRC at slow to moderate speeds; a "shadow mode" phase in which the vehicles will receive speed guidance in live traffic but automated longitudinal control will not be applied; and a fully automated control phase in which the vehicles will receive speed guidance in live traffic and automated longitudinal control will be applied to adjust speeds.

The FHWA project team for this task includes Leidos, California Partners for Advanced Transportation Technology, Texas A&M Transportation Institute, TORC Robotics, and Virginia Tech Transportation Institute.

For more information, contact Dan Dailey, 202-493-3395, daniel.dailey.ctr@dot.gov.

RECENT PERIODICALS

***Public Roads*—November/December 2014**

This issue includes: A New Approach to Improving Travel Times; One Size Doesn't Fit All; An Evolving Partnership; Bracing for Hard Times Ahead; and Surviving an Interstate Bridge Collapse.

It is available online via www.fhwa.dot.gov/publications/publicroads/14novdec/index.cfm.

For more information, contact TaMara McCrae, tamara.mccrae@dot.gov.

***Innovator:* Accelerating Innovation for the American Driving Experience—November/December 2014**

This issue includes: VERG Tells Stories with Visuals; First Responders Trained Tops 50,000 Goal; States Innovate!; Aid Demonstration Grants Go to Six Projects; Every Day Counts Makes Its Mark; and Calendar.

The issue is available online via www.fhwa.dot.gov/hfl/innovator/e-version/issue_45/.

For more information, contact Kathleen Bergeron, kathleen.bergeron@dot.gov.

Links:

Turner-Fairbank Highway Research Center:
http://www.fhwa.dot.gov/research/

Resource Center:
http://www.fhwa.dot.gov/resourcecenter/

National Highway Institute:
http://www.nhi.fhwa.dot.gov/home.aspx

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