Accelerating Infrastructure Innovations

FOCUS

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INSIDE

Advancing Bridge Safety Through FHWA's New Data-Driven Inspection Program

In 2011 the Federal Highway Administration (FHWA) introduced a new bridge safety initiative that uses systematic, data-driven, and risk-based reviews and analysis to improve oversight of how States perform their bridge inspections and manage overall bridge safety. During the first year, these reviews found that States have robust inspection programs overall, while identifying specific areas for improvement to achieve consistent compliance with the National Bridge Inspection Standards (NBIS).

The initiative replaced FHWA's prior National Bridge Inspection Program oversight practices and the annual NBIS compliance reviews conducted by FHWA State division offices. FHWA now assesses 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 file records; determination of bridge load limits; qualifications of inspection personnel; procedures for underwater, fracture-critical, and complex bridge inspections; quality bridge data; and inspection frequency.

Instead of determining an overall level of compliance for a State, FHWA makes an individual compliance determination (satisfactory, actively improving, or unsatisfactory) for each of the 23 metrics. The assessment process is based on objective data, statistical sampling of the data and inspection records, site reviews of bridges in the field, and defined criteria for compliance with each metric.

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When conducting inspections, some bridge elements can only be reached using specialized equipment.

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

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Federal Highway Administration

Advancing Bridge Safety,

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"By evaluating the inspection program in this way, FHWA and a State can more readily identify areas of good practice, those needing improvement, and how this information can be used to take corrective actions," said Barry Brecto of FHWA.

The 2011 reviews also established a baseline for future years' reviews.

Seventy-one percent of the metrics for the 50 States, District of Columbia, and Puerto Rico were assessed at the satisfactory performance level, while 29 percent were assessed as actively improving. Those listed as actively improving have tailored plans in place to accomplish the needed corrective actions to meet the requirements of the inspection standards. Less than 1 percent of the metrics were assessed at an unsatisfactory level, representing areas that need immediate attention and improvement.

Nationally, the most challenging program area is compliance with the inspection intervals identified in the NBIS, as States must balance large structure inventories, difficulties in resource allocation, and the vulnerability of bridge inspection operations to the weather and other environmental conditions. FHWA has worked with the American Association of State Highway and Transportation Officials (AASHTO) to adjust the metric assessment thresholds and issue guidance on handling special circumstances that can affect inspection schedules. Other areas that require increased attention are identifying scour critical bridges, implementing plans of actions for these structures, and establishing documented load ratings for all bridges.

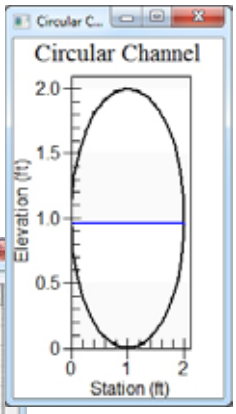
A task force formed by FHWA and AASHTO identified several recommended improvements to the bridge inspection oversight process. Many of these improvements are being implemented as part of the 2013 assessment cycle. For example, improvements have been made in the way bridge inspection quality is assessed, bridge data quality is measured, and how the procedures used for underwater bridge inspections consider and account for the risk associated with these elements. Additional changes were made to better communicate the assessment results to a broad audience and mitigate risk through clarification of inspection procedures, rather than just tighter inspection frequency tolerances.

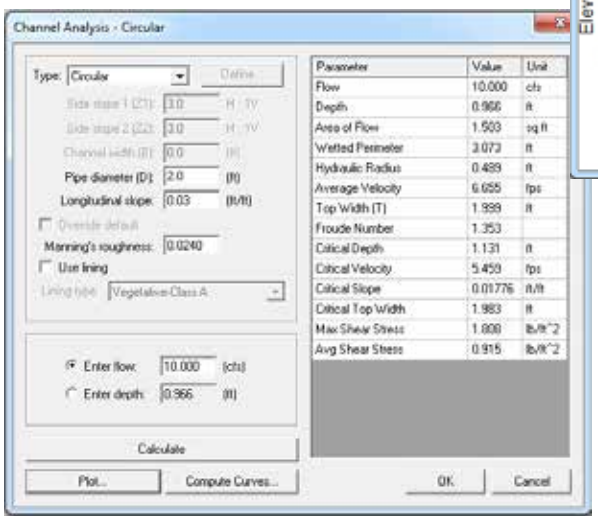
An underwater diver gets ready to inspect a bridge.

"The new oversight process has enabled States and FHWA to more strategically understand and articulate the importance, status, and needs of the national bridge inspection program," said Tom Everett of FHWA. "The improvements being made will enable States to more efficiently manage their bridges to keep them safe for the traveling public and maximize their service life. States will also be positioned to better take advantage of future advancements in data collection, bridge management, and technology innovation."

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

FHWA Hydraulic Toolbox Offers Fast and Efficient Project Design





Left: **Sample results from the FHWA Hydraulic Toolbox's Channel Analysis calculator, which computes hydraulic parameters based on normal and critical depth for five commonly used channel shapes.**
Above: **The Hydraulic Toolbox can be used to plot the water surface profile for a circular channel.**

Perform a range of hydraulics calculations and analyze multiple project scenarios with the Federal Highway Administration's (FHWA) free Hydraulic Toolbox software.

Version 4.0 of the software features 10 calculators that can perform many of the hydrologic and hydraulic computations needed for a transportation project. "The software is designed to be very intuitive, so that it can be used with a minimum amount of guidance," said Bart Bergendahl of FHWA. "The calculators do routine computations in a flash, making the analysis and design process more efficient and accurate. We have received good feedback from users, who find it very convenient to have the suite of calculators."

Four new calculators have been added since the first version of the software was released in 2010. The different types of analysis that can now be performed are:

1. *Channel.* This calculator computes a variety of hydraulic parameters based on normal and critical depth for five commonly used channel shapes and user-defined geometries.
2. *Channel Lining Design.* The calculator offers four channel lining types to choose from for designing stable roadside channels.
3. *Weir.* Hydraulic parameters for seven commonly used weir types can be computed.
4. *Curb and Gutter.* The calculator can handle both uniform and compound gutters. It also features a separate inlet capacity calculator that allows the user to define the inlet location, type, size, and efficiency.
5. *Median/Ditch Drop-Inlet.* Users can compute the amount of flow captured and bypassed by a typical drop-inlet placed in the bottom of median, roadside, or similar ditches.
6. *Rational Method Hydrology.* The calculator computes peak discharges and hydrographs.
7. *Detention Basin.* An inflow hydrograph can be routed through a user-defined detention basin and outlet structure.
8. *Riprap Design.* Eight applications are offered for riprap countermeasure design.
9. *Gradation Analysis.* Rock and sediment gradations can be developed by either entering a set of measured particle sizes or processing a digital photograph of the particles.
10. *Culvert Assessment.* Culvert repair or rehabilitation recommendations can be generated by entering field assessment data on existing culvert condition and performance.

All calculations can be saved in one data file. Notes can also be saved with the data file. For example, a user can add notes on the project's location and any assumptions or special considerations that were made when performing a given analysis. The "Report Generator" feature can be used to create a report summarizing all of the hydraulic calculations and results for the project.

The Toolbox also includes a Desktop Reference Guide. Among the topics highlighted in the guide are the software's graphical user interface, calculator descriptions, basic technical concepts, and report capabilities. Also covered are the software's governing equations, as well as how to manage files and save project data.

FHWA expects to release Version 4.1 of the software in Spring 2013. This release will add a set of bridge scour component calculators for bridge foundation analysis and design.

To download the Hydraulic Toolbox, visit www.fhwa.dot.gov/engineering/hydraulics/software/toolbox404.cfm. The software is compatible with Windows®-based operating systems. For more information on the Hydraulic Toolbox, contact Larry Arneson at the FHWA Resource Center, 720-963-3200 (email: larry.arneson@dot.gov), or Bart Bergendahl in the FHWA Central Federal Lands Highway Division office, 720-963-3754 (email: bart.bergendahl@dot.gov). To learn about additional hydraulics engineering resources available from FHWA, visit www.fhwa.dot.gov/engineering/hydraulics. *

FHWA Awards Funding for Innovative Bridge Research and Deployment Program

From the "bridge in a backpack" to self propelled modular transporters (SPMTs), advances in bridge construction will be seen across the country as the Federal Highway Administration (FHWA) awarded $5,848,655 in funding to projects in 19 States under its Innovative Bridge Research and Deployment (IBRD) program. The program is designed to promote, demonstrate, evaluate, and document the application of innovative designs, materials, and construction methods in the construction, repair, and rehabilitation of bridges and other highway structures.

IBRD funds may be used for preliminary engineering, repair, rehabilitation, or construction work, as well as project performance evaluation and performance monitoring of the structure following construction. Projects may be located on any public roadway, including both State and local projects. To be eligible for funding, projects must meet one or more of the eight program goals. These goals include the development of new, cost-effective, and innovative highway bridge applications and the development of construction techniques to increase safety and reduce construction time and traffic congestion. For more information on the program goals, visit www.fhwa.dot.gov/bridge/ibrd/eligibility.cfm.

Ultra-high performance concrete (UHPC) is among the technologies promoted by FHWA's Innovative Bridge Research and Deployment program. Structures that have used UHPC across the country include the Route 31 bridge in Lyons, NY.

Louisiana received $400,000 for its Bayou LaFourche bridge project on U.S. 80. This seven-span, 166-m (546-ft) long bridge will be built with precast, prestressed girders and a full-depth precast deck using the AccelBridge™ system, which does not require post-tensioning tendons in the deck or the girders.

In Maine, the Bridgewater Boundary bridge replacement in Bridgewater received $300,000. The current bridge, which was constructed in 1933, will be replaced with a 33-m (110-ft) span using precast integral abutments that are transversely post-tensioned to accelerate the construction. The new bridge will also use corrosion-resistant weathering steel girders in the superstructure.

Michigan was awarded $400,000 for its construction of a 32-m (105-ft) new bridge on U.S. 23 Northbound over I-96 Westbound in Livingston County. To minimize traffic impacts at this high-volume interchange, all components of the new bridge will be constructed adjacent to the existing bridge and either slid into place or moved into place using SPMTs.

SPMTs will also be employed by Pennsylvania as it uses prefabricated bridge elements and systems (PBES) to replace a 46-m (153-ft) long structure that crosses a railroad line in Lawrence County. The accelerated construction techniques supported by Pennsylvania's $400,000 grant will reduce costs while minimizing delays to motorists.

In Missouri, a $204,255 award will be used to replace the Rustic Road bridge over the North Fork of Grindstone Creek in Columbia. The 17-m (58-ft) span will be replaced using Geosynthetic Reinforced Soil (GRS) abutments and a prefabricated bridge system composed of galvanized steel tub girders and a precast concrete deck made composite with the girders. This project could pave the way for the innovative prefabricated system to become an option for other low-volume bridges in Missouri.

New Mexico received $170,000 for the replacement of the NM 419 bridge over Arroyo Mesteno and the NM 419 bridge near Trementina. These two simple-span timber bridges will be replaced with completely prefabricated systems and GRS abutment walls and wing walls.

A $350,000 award will help Iowa as it replaces the Amish Sawmill bridge in Buchanan County with a new structure that has a bent steel plate girder section supported on GRS abutments.

New York will use its $370,000 grant to replace a 9-m (30-ft) long and 8-m (26-ft) wide bridge with a 60-ft single-span, 33-ft wide structure. PBES will be used to construct both the bridge's substructure and superstructure.

PBES and accelerated bridge construction techniques will also be used by Oklahoma, which received $140,000 to evaluate the use of precast abutments, transverse bridge sliding using temporary or permanent supports, and bridge moving using SPMTs for construction of a bridge on State Highway 51 over Cottonwood Creek.

In Puerto Rico, a $400,000 award will support use of PBES for both the superstructure and substructure as Bridge No. 194 over the Blanco River is replaced.

South Carolina received $245,000 to use and compare two different types of PBES as it constructs a four-span, 67-m (220-ft) long, and 12-m (40-ft) wide bridge on S-770 over Hanging Rock Creek. The bridge will be instrumented, load tested,

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Today's innovative bridge technologies also include prefabricated bridge elements and systems. Here, the prefabricated superstructure of the 4500 South bridge in Salt Lake City, UT, is installed using a self propelled modular transporter.

and structurally monitored for 18 months following construction.

A $252,000 award will help fund use of PBES for a bridge deck replacement on the heavily traveled I-84 in the Boise, Idaho, metropolitan area. The project will be one of the first in Idaho to use the technology.

Texas will use its award of $30,000 to support construction of an 18-m (60-ft) long, 9-m (32-ft) wide bridge in Hemphill County using a prestressed concrete deck slab beam superstructure. The bridge will also feature a precast concrete substructure.

Ohio received $227,400 to use ultra-high performance concrete (UHPC) to improve the design and performance of the Sollars Road bridge over Lees Creek in Fayette County. The Ohio Department of Transportation is partnering with Ohio University to instrument the bridge to determine the transverse load transfer ability of the bridge system.

The $400,000 received by Oregon will support implementation of a new concrete bridge deck mixture specifically formulated to reduce deck wear from studded tires. Developed in cooperation with FHWA, the new mix will be used for the first time in the replacement of a 1934 timber bridge on U.S. 26 over West Humbug Creek. Oregon will also use UHPC for closure joints between the bridge deck panels.

Rhode Island will use its $360,000 award to build a 7-m (24-ft) long, 9-m (32-ft) wide, single-span buried arch bridge using the "Bridge in a Backpack" system developed at the University of Maine. The system uses prefabricated fiber reinforced polymer tubes with self-consolidating concrete and precast concrete elements.

Connecticut, which was awarded $400,000, will also use the "Bridge in a Backpack" to accelerate construction of a bridge on Route 57 over the West Branch Saugatuck River in Weston.

Washington State received $400,000 to fund use of advanced materials for the replacement of the Alaskan Way Northbound off-ramp bridge in Seattle. These materials include Shape Memory Alloy, which can deform beyond its elastic limit and fully recover after a seismic event, and Engineered Cementitious Composites.

A $400,000 grant will support Wyoming's construction of an 85-m (280-ft) continuous welded plate girder bridge using high performance steel at the U.S. 20/26 Spur Interchange in Casper. The deck will feature full-depth, precast, and post-tensioned deck panels.

To learn more about the IBRD program, visit www.fhwa.dot.gov/bridge/ibrd/index.cfm, or contact Raj Ailaney at FHWA, 202-366-6749 (email: raj.ailaney@dot.gov).

Innovative Bridge Technology Resources

To learn more about accelerated bridge construction (ABC) technologies and resources, visit www.fhwa.dot.gov/bridge/abc/index.cfm. Topics featured include project planning, geotechnical solutions such as the Geosynthetic Reinforced Soil Integrated Bridge System (GRS-IBS) and rapid embankment construction, and structural solutions such as prefabricated bridge elements and systems (PBES). Information on Webinars and other events and a list of useful FHWA contacts are posted as well.

Resources for ABC, GRS-IBS, and PBES are also available at www.fhwa.dot.gov/everydaycounts.

For details on ultra-high performance concrete research and implementation projects, visit www.fhwa.dot.gov/research/resources/uhpc.cfm. Resources include overview information, articles, and reports.

Information on the "Bridge in a Backpack" is available at www2.umaine.edu/aewc/content/view/185/71.

Visit www.fhwa.dot.gov/bridge/abc/index.cfm to learn more about accelerated bridge construction.

Extend Your Roadway Network with Asphalt Pavement In-Place Recycling Techniques

Learn about a sustainable and cost-effective alternative to traditional asphalt pavement rehabilitation practices with a new course available from the Federal Highway Administration's (FHWA) National Highway Institute (NHI), Asphalt Pavement In-Place Recycling Techniques (Course No. FHWA-NHI-131050).

"FHWA supports in-place recycling as a viable option for extending the Nation's transportation network," said Lee Gallivan of FHWA.

Developed in partnership with the Asphalt Recycling and Reclaiming Association, the course examines three principal recycling techniques: hot in-place, cold in-place, and full depth reclamation. Participants will learn how to select the appropriate technique for a given set of conditions, including different traffic levels, pavement conditions, and environments; choose project materials; develop suitable specifications; and construct projects effectively, including how to address issues that may impact a project's constructability.

The course combines two Web-based training modules with 2 days of classroom training. The Web-based lessons introduce pavement evaluation techniques and the three potential recycling techniques, along with the types of equipment commonly used for each. Classroom sessions focus on project and technique selection and justification, materials consideration and mix design, construction specifications, and project control considerations during construction.

The target audience is State and local transportation agency engineers, particularly those staff responsible for selecting

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Highway Technology Calendar

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

Transportation Research Board (TRB) 92nd Annual Meeting
January 13–17, 2013, Washington, DC

More than 11,000 transportation professionals from around the world will gather to share perspectives on developments in transportation research, policy, and practice. The theme for 2013 is "Deploying Transportation Research—Doing Things Smarter, Better, Faster."

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.

2013 Design-Build in Transportation Conference
March 18–20, 2013, Orlando, FL

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

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

Seventh National Seismic Conference on Bridges and Highways
May 20–22, 2013, Oakland, CA

Conference sessions will focus on understanding and mitigating damage to the Nation's highway infrastructure from earthquakes and other natural hazards. Sponsors include FHWA; the California Department of Transportation; TRB; American Association of State Highway and Transportation Officials; University at Buffalo, The State University of New York; and the Multidisciplinary Center for Earthquake Engineering Research.

Contact: Phillip Yen at FHWA, 202-366-5604 (email: wen-huei.yen@dot.gov), or visit http://7nsc.info.

Second National Covered Bridge Conference
June 5–8, 2013, Dayton, OH

The FHWA National Historic Covered Bridge Preservation Program is sponsoring the conference in partnership with the National Park Service and U.S. Forest Service. Themes include research and rehabilitation projects, best practices for rehabilitation, and continuing threats and challenges to covered bridges, including damage caused by Hurricane Irene and Tropical Storm Lee in 2011. Participants will have the opportunity to tour several historic covered bridges.

Contact: Everett Matias at FHWA, 202-366-6712 (email: everett.matias@dot.gov), or visit www.woodcenter.org/2013-national-covered-bridge-conference. *

Infrastructure Innovation Webinars

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

Geographic Information System (GIS) and Optimization Tools for Linking Transportation and Natural Resource Planning
December 20, 2012, 2:30–4 p.m. (eastern standard time)

Learn how optimization decision support tools, project selection criteria development techniques, and green infrastructure mapping can be used to better balance the needs of transportation projects with environmental concerns. The Webinar is sponsored by the Federal Highway Administration's (FHWA) Highways for LIFE (HfL) program and American Association of State Highway and Transportation Officials (AASHTO) Technology Implementation Group.

The session will review project selection criteria strategies that use the Logic Scoring of Preference method for prioritizing projects. Case studies on applying optimization as part of green infrastructure planning will also be highlighted. When used in a collaborative process among transportation and natural resources agencies, optimization tools can be used to guide transportation decisions and deliver high-quality, cost-effective outcomes.

The Webinar is a follow-up to the June 2011 session on "Transportation Innovations: Linking Transportation and Natural Resource Planning Through Environmental GIS Tools." To view a recording of the 2011 Webinar, visit https://connectdot.connectsolutions.com/n134083201106. To register for the upcoming session, visit www.nhi.fhwa.dot.gov/resources/webconference/web_conf_learner_reg.aspx?webconfid=25385. For more information, contact Byron Lord at FHWA, 202-366-1325 (email: byron.lord@dot.gov).

Transportation Asset Management Webinar Series

Asset Management and Performance Management
January 9, 2013, 2–3:30 p.m. (eastern standard time)

The Webinar will provide an overview of successful practices for integrating asset management (AM) and performance management. Presentations will highlight how AM and performance management strategies complement each other within State transportation agencies. Representatives from State agencies will also discuss their efforts to develop an AM and performance management framework and use AM strategies to improve agency performance.

Asset Management Business Models and Barriers to Implementation
March 13, 2013, 2–3:30 p.m. (eastern standard time)

Presentations will explore the strengths and limitations of specific AM business models and share lessons learned in overcoming barriers to implementation. Discussions will focus on integrating organizational units, systems, and data with agencies' AM business models. State agency representatives will also discuss how strong AM practices can help in building the case for needed funding.

The Webinar series is sponsored by AASHTO and FHWA. For more information or to register, visit http://tam.transportation.org/Pages/Webinars.aspx. Information is also available by contacting Steve Gaj at FHWA, 202-366-1336 (email: stephen.gaj@dot.gov).

Severe-Duty Crash Attenuator
January 17, 2013, 2:30–4 p.m. (eastern standard time)

Severe-duty crash attenuators are particularly suitable for high-incidence roadway locations, offering superior cost effectiveness and improved safety for the traveling public and highway workers. The units perform well in roadway design speed and frontal and side impact tests, reducing repair costs and the time needed for repairs. Sponsored by FHWA's HfL program, the Webinar will highlight the experiences of the California, Kansas, and Nevada departments of transportation, including lessons learned on which crash cushions work well in given situations, durability of the devices, and repair information.

Registration information will be available in early January at www.fhwa.dot.gov/hfl/innovations/webinars.cfm. For more information, contact Byron Lord at FHWA, 202-366-1325 (email: byron.lord@dot.gov).

Upcoming Webinar topics for February–April 2013 include Bridge Bent System for Seismic Regions, Composite Bridge Decking, and Using Ultra-High Performance Concrete in Bridge Decks and Field Cast Joints. *

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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To learn more about the Asphalt Pavement In-Place Recycling Techniques course and other training opportunities, visit www.nhi.fhwa.dot.gov.

and designing asphalt in-place recycling projects, writing effective specifications, or inspecting in-place recycling projects during construction. Contractors, consulting engineers, and industry representatives can also benefit from the course.

For additional information or to schedule the course in your State, visit www.nhi.fhwa.dot.gov. The cost is $400 per participant, with a minimum class size of 20 and a maximum of 30. To learn more about the course content, contact Lee Gallivan at FHWA, 317-226-7493 (email: victor.gallivan@dot.gov). For information on FHWA's Recycling Policy, visit www.fhwa.dot.gov/legsregs/directives/policy/recmatpolicy.htm. *