

FOCUS

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Accelerating Infrastructure Innovations: Goodbye *Focus*, Hello *Innovator*

From Superpave to high-performance concrete (HPC) to prefabricated bridge technologies, *Focus* has always been about accelerating infrastructure innovations.

At its beginning in 1987, that meant chronicling the groundbreaking work of the Strategic Highway Research Program (SHRP). This was followed by comprehensive coverage of SHRP technology implementation efforts. Pavement preservation strategies, anti-icing techniques, HPC pavements and bridges, and the growth in Superpave use nationwide were among the featured technologies resulting from SHRP's success.

After SHRP implementation ended in 2000, *Focus* continued to report on the real-life experiences of States using SHRP products, but coverage also expanded to include a broader range of infrastructure-related developments. Asset management, accelerated bridge construction, highway materials innovations, work zone safety improvements, and advancements in long-term bridge performance are just some of the technologies that have shared the *Focus* spotlight since then. Recent years have also featured a new millennium's crop of innova-

tions resulting from SHRP2 and the Federal Highway Administration's (FHWA) Every Day Counts (EDC) initiative.

This issue is the last *Focus*. But FHWA's *Innovator* newsletter will continue to report on the latest in highway innovation topics. Dedicated to "Accelerating Innovation for the American Driving Experience," recent *Innovator* topics have included warm-mix asphalt, smart work zones, and the geosynthetic reinforced soil integrated bridge system. All *Focus* subscribers will receive the electronic version of *Innovator*, though subscribers not interested in continuing to receive the publication will, of course, be able to opt out. To check out past issues of the *Innovator*, visit www.fhwa.dot.gov/hfl/innovator. FHWA's SHRP2 Solutions (www.fhwa.dot.gov/goshrp2) and EDC (www.fhwa.dot.gov/everydaycounts) Web sites are also your current go-to spots for the latest in highway infrastructure advancements.

Say goodbye to *Focus* this month, but with the help of FHWA's many other technology resources, continue to say hello to the innovations that are reinventing America's highways and bridges both for today and well into the future. *

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



U.S. Department
of Transportation
**Federal Highway
Administration**



Rock Solid

Rockeries Offer Context-Sensitive Slope Solutions

For highway agencies looking for a cost-effective and aesthetically appealing option when building gravity-retaining structures along rural roadways, rockeries offer a historical and yet sustainable solution.

Rockeries are an engineered system of dry stacked angular rocks placed without mortar, concrete, or steel reinforcement. Often built with local native stone, they rely on the weight, size, shape, and interface friction of the rock elements to provide overall stability. Rock dimensions are generally greater than 450 mm (18 in), while the rock weights are greater than 90 kg (200 lb). The structures achieve stability through the mass of the rocks and inter-rock friction. A retaining rockery supports itself and resists lateral earth pressures, preventing erosion and slope collapse.

Rockeries dating back to the late 1800s can still be found in the United States, along with many others built in the 1930s along National Forest and National Park roads. “We continue to find situations where new rockery construction would be advantageous,” said Khamis Haramy of the Federal Highway Administration (FHWA). “Rockeries continue to gain in popularity throughout the western United States.” For example, an increasing number of rockeries have been built in northern California and Nevada over the last 15 years. In 2005 and 2006, FHWA’s Federal Lands Highway division designed and constructed rockeries for the Guanella Pass Road project in the Pike National Forest in Colorado.



FHWA used rockeries to improve safety and reduce maintenance needs when reconstructing part of the Beaver to Junction Highway in southern Utah.



Rockeries are an engineered system of dry stacked angular rocks placed without mortar, concrete, or steel reinforcement.

Use had been hampered, however, by a lack of statewide or national design standards and construction guidelines. FHWA’s *Rockery Design and Construction Guidelines* (Pub. No. FHWA-CFL/TD-06-006) provide highway designers, inspectors, and contractors with a basis for evaluating existing rockeries and specifying and constructing

new ones. The guidelines define and evaluate rockery stability as a function of the rockery geometry, rock properties and placement, and lateral earth pressure. “These guidelines give roadway designers and owners confidence that these structures can be used in modern highway engineering,” said Roger Surdahl of FHWA.

The guidelines cover static and seismic stability design, tiered rockeries, and other various layouts. Also featured are construction recommendations, including excavation, rock placement, drainage



Rockerries built by FHWA on Bear Lake Road in Colorado's Rocky Mountain National Park have improved both safety and aesthetics.



details, and backfill selection. Field inspection guidelines are included as well. Agencies and contractors will also find guidance on evaluating the stability of existing historic rockeries and sample specifications that can be modified as necessary to meet the specifics of each individual project. The guidelines' appendices include a sample design problem and details for sample rockery sections.

Since the guidelines were issued, FHWA's Federal Lands Highway division has designed and completed several rockeries projects. Using rockeries and timber-faced steel guardrails on a 7.7-km (4.8-mi) section of Bear Lake Road in Rocky Mountain National Park in Colorado, for example, reduced costs

while meeting the project's requirements for context-sensitive design that would match the road's rustic setting. Completed in summer 2013, the project improved both safety and aesthetics on the roadway.

FHWA also used rockeries when reconstructing 3.2 km (2 mi) of roadway on the Beaver to Junction Highway (SR 153) in southern Utah. Completed in fall 2012, the project's scope included widening the roadway to create a consistent standard roadway width while upgrading the road's horizontal and vertical alignments. "Rock fall hazards are of major concern along this portion of SR 153," said Haramy. The only rockfall mitigation measures previously in place were

small roadside ditches. To improve safety and reduce maintenance needs, the reconstructed roadway includes new mitigation measures, such as cut-side walls featuring rockeries approaching 7 m (20 ft) in height. These slope-stabilizing rockeries also provide a sustainability benefit by using onsite boulders.

To download a copy of FHWA's *Rockery Design and Construction Guidelines*, visit www.cflhd.gov/programs/techDevelopment/geotech/rockeries. For more information on the guidelines, contact Khamis Haramy at FHWA, 720-963-3521 (email: khamis.haramy@dot.gov). *

Protecting Transportation Investments with Risk-Based Asset Management

A new series of reports available from the Federal Highway Administration (FHWA) examines how transportation agencies can use risk management to better protect their highway infrastructure investments, improve decisionmaking, and demonstrate accountability.

Until recently, transportation agencies have largely used risk management at the project level during construction. Managing risks at the project level helps to identify threats to the cost, scope, and schedule, as well as opportunities to keep projects on track. However, risk management can also pay dividends at the broader program and organizational levels, particularly when agencies face funding challenges. For example, the Washington State Department of Transportation (WSDOT) tracks and forecasts potential risks to assets. Based on the classification, age, condition, performance, and projected risk to assets, WSDOT then develops and implements reconstruction and preservation strategies. Agencies can also use risk management to prepare for and respond to such external risks as extreme weather events, climate change, and major economic downturns.

Managing risk is an integral step in following a comprehensive asset management framework, as described in the *American Association of State Highway and Transportation Officials Asset Management Guide—A Focus on Implementation*. And under the Moving Ahead for Progress in the 21st Century Act (MAP-21), States are to develop risk-based transportation asset management plans.

State transportation agencies with a process for undertaking a risk management analysis for their highway network would include identification, assessment, evaluation, and prioritization of risks that can affect the condition, effectiveness, and system performance as it relates to operation of

their physical assets. Agencies would also include an approach for addressing the risks that they determine to be high priority.

“This series of reports will help transportation agencies as they develop their asset management plans and make complex infrastructure investment decisions and communicate them effectively to the public,” said Steve Gaj of FHWA.

Five reports are available in the Risk-Based Transportation Asset Management series:

- Report 1: *Evaluating Threats, Capitalizing on Opportunities* (Pub. No. FHWA-HIF-12-035).
- Report 2: *Examining Risk-Based Approaches to Transportation Asset Management* (Pub. No. FHWA-HIF-12-050).

- Report 3: *Achieving Policy Objectives by Managing Risks* (Pub. No. FHWA-HIF-12-054).
- Report 4: *Managing Risks to Networks, Corridors, and Critical Structures* (Pub. No. FHWA-HIF-13-017).
- Report 5: *Building Resilience into Transportation Assets* (Pub. No. FHWA-HIF-13-018).

To download all of the reports, visit www.fhwa.dot.gov/asset/pubs.cfm?thisarea=risk. For more information on risk-based transportation asset management, contact Nastaran Saadatmand at FHWA, 202-366-1337 (email: nastaran.saadatmand@dot.gov), or Steve Gaj at FHWA, 202-366-1336 (email: stephen.gaj@dot.gov).*

Investing in the Future of Pavement Management

As transportation agencies have changed the way they do business in recent years, including the increased use of asset management principles for resource allocation and other decisionmaking, the role of pavement management has changed also. Pavement management continues to evolve as it moves from reporting pavement condition, optimizing projects, and estimating funding needs to supporting asset management practices, linking maintenance and preservation activities, and providing performance data for calibrating the *Mechanistic-Empirical Pavement Design Guide* models and other performance-based models.

Data collection technologies have also evolved over the years, moving from visual pavement condition surveys to modern automated techniques. As data collection becomes more efficient, accurate, and precise, agencies can use the better quality data

to make more informed decisions. This has become even more important in the face of shrinking funding, an aging pavement network, and increased traffic demands.

These advances in pavement management are fulfilling the vision of FHWA's *Pavement Management Roadmap* (Pub. No. FHWA-HIF-11-011). The *Roadmap* outlines research and development initiatives and priorities needed by the year 2020 to address the country's pavement management needs at the project, network, and strategic levels. To learn more about completed and ongoing projects, including research into new applications of pavement management data, strategies for incorporating emerging technologies into pavement management systems, and steps to achieving more sustainable pavement management, visit FHWA's *Pavement Management Roadmap* Web site at www.fhwa.dot.gov/pavement/management/roadmap.

Participate in the LTPP Warm-Mix Asphalt Study

The Federal Highway Administration's (FHWA) Long-Term Pavement Performance (LTPP) program is now recruiting test projects for a new warm-mix asphalt study.

"This is an excellent opportunity for highway agencies to learn about the long-term performance of different warm-mix asphalt technologies available today," said Jack Springer of FHWA. Monitoring the mix design and construction of warm-mix asphalt pavements from the time of placement to the end of performance will provide valuable information on the benefits offered by the technology. Projects that will be constructed between 2014 and 2016 are eligible to participate in the study. The recruitment period runs until May 2014.

For more information on the nomination process, site requirements, and highway agency responsibilities, contact Aramis Lopez at FHWA, 202-493-3145 (email: aramis.lopez@dot.gov). To learn more about the LTPP program, visit www.fhwa.dot.gov/research/tfhrp/programs/infrastructure/pavements/ltpplp. *



USDOT Publishes Notices of Proposed Rulemaking

In March 2014, the U.S. Department of Transportation (USDOT) published two interrelated Notices of Proposed Rulemaking (NPRMs) in the *Federal Register*, as required by the Moving Ahead for Progress in the 21st Century Act (MAP-21).

The Safety Performance Measures NPRM proposes safety performance measures and State department of transportation and metropolitan planning organization requirements for establishing and reporting specific annual targets for highway fatalities and serious injuries. To review this NPRM, visit www.federalregister.gov/articles/2014/03/11/2014-05152/national-performance-management-measures-highway-safety-improvement-program. To submit comments to the docket, visit www.regulations.gov/#!docketDetail;D=FHWA-2013-0020. The comments period ends June 9, 2014. A related fact sheet is available at www.fhwa.dot.gov/tpm/rule/safetyfactsheet.pdf, while Webcast recordings on the NPRM and other aspects of transportation performance management can be downloaded at www.fhwa.dot.gov/tpm/resources/presentations.cfm.

The Highway Safety Improvement Program (HSIP) NPRM updates the existing HSIP requirements contained in 23 Code of Federal Regulations Part 924 and proposes a subset of the model inventory of roadway elements for all public roads, a Strategic

Highway Safety Plan update cycle, and other revisions to implement MAP-21 provisions. The NPRM also clarifies existing regulatory language. To review the NPRM, visit www.federalregister.gov/articles/2014/03/28/2014-06681/highway-safety-improvement-program. To submit comments to the docket, visit www.regulations.gov/#!docketDetail;D=FHWA-2013-0019. The comments period ends May 27, 2014. Additional information is available at <http://safety.fhwa.dot.gov/hsip/nprm>.

USDOT anticipates publishing a third related NPRM that will address proposed updates to the statewide, metropolitan, and nonmetropolitan planning regulations. This notice will also be open for public comment. The three NPRMs are among USDOT's proposals to implement MAP-21 performance provisions for the Federal-aid highway program.

A second set of forthcoming performance-related NPRMs will focus on pavements, bridges, and asset management, while a third set will concentrate on congestion, emissions, system performance, freight, and public transportation.

For more information on transportation performance management, visit www.fhwa.dot.gov/tpm/index.cfm. Questions about the performance-related NPRMs can be emailed to PerformanceMeasuresRulemaking@dot.gov. *

The three NPRMs are among USDOT's proposals to implement MAP-21 performance provisions for the Federal-aid highway program.

Infrastructure Innovation Webinars

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

SHRP2 Tuesdays Webinar Series

Upcoming Webinars sponsored by the Transportation Research Board (TRB) through its second Strategic Highway Research Program (SHRP2) Tuesdays Webinar series include:

High-Speed Nondestructive Testing Methods for Mapping Voids, Debonding, Delaminations, Moisture, and Other Defects Behind or Within Tunnel Linings
April 22, 2014, 2–3:30 p.m.
eastern daylight time (EDT)

Participants will learn about SHRP2 Project R06G, which identified nondestructive testing technologies for evaluating the condition of various tunnel linings and tunnel lining finishes. The project advanced both hardware and software development for the most promising technologies and demonstrated the technologies' ability to detect flaws within or verify the condition of the targeted tunnel components.

To register, visit www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/170402.aspx. For more information, contact Linda Mason at TRB, 202-334-3241 (email: lmason@nas.edu).

Identifying and Reducing Worker, Inspector, and Manager Fatigue in Rapid Renewal Environments
April 29, 2014, 2–3:30 p.m. EDT

The Webinar will highlight the work of SHRP2 Project R03, which documented worker fatigue impacts during rapid renewal operations in the highway construction industry. A new *Fatigue Risk Management Guide for Rapid Renewal*

Highway Construction Projects is now available, as well as the project report, *Identifying and Reducing Worker, Inspector, and Manager Fatigue in Rapid Renewal Environments*. Participants will learn how to define the risk factors associated with workplace fatigue, identify procedures to manage those risk factors, and apply the new guide's recommendations for use in their own agencies.

To register, visit www.trb.org/ElectronicSessions/Blurbs/170515.aspx. For more information, contact Linda Mason at TRB, 202-334-3241 (email: lmason@nas.edu).

Bridges Beyond 100 Years: Innovative Systems

May 6, 2014, 2–3:30 p.m. EDT

The session will summarize SHRP2 Project R19B, which developed new design codes, performance measures, and implementation tools that can lead to longer and more predictable bridge service life. The project produced a report, *Bridges for Service Life Beyond 100 Years: Service Limit State Design*, which addresses the performance measures and design procedures that maximize the actual life of a bridge. Webinar topics will also include proposed changes to the American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design Bridge Design Specifications.

To register, visit www.trb.org/StrategicHighwayResearchProgram2SHRP2/Blurbs/170504.aspx. For more information, contact Linda Mason at TRB, 202-334-3241 (email: lmason@nas.edu).

Managing and Sharing 3D Models for Construction

May 7, 2014, 1–2:30 p.m. EDT

The Webinar will highlight the use of 3D engineered models in transportation construction work. This session is fifth in an FHWA series on 3D Engineered Models for Construction. For details on registration and to find recordings and presentations from the first four Webinars in the series, visit www.fhwa.dot.gov/construction/3d/webinars.cfm.

For more information, contact Douglas Townes at the FHWA Resource Center, 404-562-3914 (email: douglas.townes@dot.gov).

Transportation Asset Management (TAM) Webinar Series

Presented by AASHTO and FHWA, upcoming topics in this ongoing Webinar series include:

Approaches to Integrating Risk into TAM Programs and Plans,
June 11, 2014, 2 p.m. EDT

Managing Off-System Assets,
August 13, 2014, 2 p.m. EDT

Transportation Asset Management Financial Plans,
October 8, 2014, 2 p.m. EDT

For more details and registration information, visit <http://tam.transportation.org/Pages/Webinars.aspx>. *

Highway Technology Calendar

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

National Bridge Preservation Partnership Conference 2014

April 21–25, 2014, Orlando, FL

Sessions will cover such topics as best practices; new materials, equipment, technologies, and research; and sustainable long-term performance. Interactive workshops will spotlight bridge preservation tools. Conference sponsors include the American Association of State Highway and Transportation Officials (AASHTO), Transportation Research Board (TRB), National Center for Pavement Preservation, and the Federal Highway Administration (FHWA).

Contact: Anwar Ahmad at FHWA, 202-366-8501 (email: anwar.ahmad@dot.gov), or visit www.nbppc2014.org.

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 decision-making, and adaptation to extreme weather events and climate change, including using risk assessment and vulnerability analysis. Strategies for overcoming barriers to asset management implementation will also be discussed. Organized by TRB, the conference is also supported by FHWA and AASHTO.

Contact: Steve Gaj at FHWA, 202-366-1336 (email: stephen.gaj@dot.gov), or visit www.trb.org/conferences/AssetManagement2014.aspx.

2014 Tools of the Trade Conference

July 21–23, 2014, Burlington, VT

Sponsored by TRB, the conference will spotlight practical transportation planning techniques and tools for use by practitioners in small and medium-sized communities. Researchers, members of academia, and other members of the transportation community are also encouraged to attend. Among the topics are the project programming process, including evaluating and prioritizing projects with performance measures; financial strategies; pedestrian and bike planning; traffic operations and analysis; demand forecasting; and systems analysis. Technology applications, environmental and health issues, and freight logistics will also be featured.

Contact: For additional information, visit www.trbtoolsofthetrade.org/conference/index.html.

Seventh National and International In-Place Recycling Conference and Workshop

August 5–7, 2014, Denver, CO

Featured topics will include project selection, performance of in-place recycling technologies, sustainability benefits, structural and mixture designs, specifications, and construction operations. Event supporters include FHWA, Asphalt Recycling and Reclaiming Association, Asphalt Institute, and the National Center for Pavement Preservation.

Contact: Lee Gallivan at FHWA, 317-226-7493 (email: victor.gallivan@dot.gov).

2014 National Hydraulic Engineering Conference: Designing Sustainable Infrastructure in a Changing Environment

August 19–22, 2014, Iowa City, IA

Sponsored by FHWA, in coordination with the University of Iowa, the conference will feature such topics as stream stability, watershed management, scour and bridge hydraulics, coastal engineering, climate change, hydrology, and asset management.

Contact: Cynthia Nurmi at the FHWA Resource Center, 404-562-3908 (email: cynthia.nurmi@dot.gov), or visit www.uiowa.edu/~confinst/nhec2014/index.html.

2014 National Accelerated Bridge Construction Conference

December 3–5, 2014, Miami, FL

The latest knowledge, technologies, and case studies related to accelerated bridge construction (ABC) will be spotlighted at the conference. Several workshops on ABC topics will be held December 3, followed by the conference kick-off on December 4. Cosponsored by FHWA and 16 State transportation agencies, the event is organized by the Accelerated Bridge Construction University Transportation Center at Florida International University. Attendees will include State bridge engineers, design professionals, fabricators, contractors, members of academia, and representatives from Federal agencies.

Contact: Atorod Azizinamini at Florida International University, 402-770-6210 (email: aazizina@fiu.edu), or Ben Beerman at the FHWA Resource Center, 404-562-3930 (email: benjamin.beerman@dot.gov).*

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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FHWA Offers Highway Friction Tester Demonstrations

Schedule an onsite demonstration of the Federal Highway Administration's (FHWA) Highway Friction Tester (HFT).

The HFT is a self-contained testing vehicle that maps friction at .30-m (1-ft) intervals continuously along a pavement section. Agencies can use the friction data for both network-level and project-level applications. Continuous friction testing improves an agency's ability to measure friction through intersections and around curves, and provides a more comprehensive picture of how friction varies for a section of pavement. The HFT also delivers a coefficient of friction that is more representative of conditions experienced by vehicles with modern anti-lock braking systems.

FHWA's onsite demonstrations offer States an overview of the HFT's testing and

data reporting capabilities, allowing agencies to conduct friction testing on their local pavement surfaces. Demonstrations may range from a half-day to up to 5 days, depending on the testing location and the agency's goals for the demonstrations. FHWA offers demonstrations free of charge, but may require participating agencies to provide traffic control.

To schedule a demonstration, contact The Transtec Group at 512-451-6233, or request a demonstration online at www.thetranstecgroup.com/highway-friction-tester-demonstration. For more information about the HFT, contact Bob Orthmeyer at FHWA, 708-283-3533 (email: robert.orthmeyer@dot.gov), or David Merritt at The Transtec Group, 512-451-6233 (email: dmerritt@thetranstecgroup.com). *



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FHWA is offering onsite demonstrations of its Highway Friction Tester, allowing agencies to conduct friction testing on their local pavement surfaces.