Accelerating Infrastructure Innovations

FOCUS

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INSIDE

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U.S. Department of Transportation
Federal Highway Administration

A State-of-the-Art Load Rating Method: Resources for Implementing LRFR

New resources are available from the Federal Highway Administration (FHWA) to assist State transportation departments in implementing the Load and Resistance Factor Rating (LRFR) method for evaluating bridge condition and determining a load rating. Since October 1, 2010, all new bridges and bridges that are being completely replaced must be load rated using the LRFR method. The new method is improving the safety of bridges by incorporating state-of-the-art rating methodology for bridge loads. Load and resistance factors are calibrated using statistical data on loads and materials.

States have realized many advantages from using LRFR, including the system's ability to accommodate State-specific legal and permit loads, as well as local live load statistics. "The LRFR method offers greater consistency and uniformity in reliability. Using this method, we can be more confident about the level of safety," said Lubin Gao of FHWA.

To support use of LRFR, FHWA established an LRFR Implementation Working Group in April 2011. The group includes representatives from FHWA's Office of Bridge Technology, Resource Center, and Division offices. A National LRFR Implementation Status Survey conduct-

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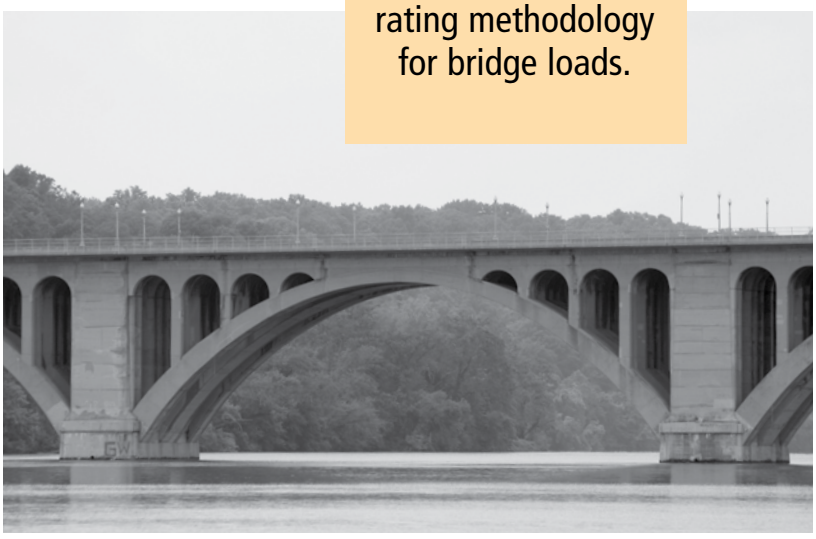
The new method is improving the safety of bridges by incorporating state-of-the-art rating methodology for bridge loads.



FHWA's new resources can assist States in implementing the LRFR method for evaluating bridge condition and determining a load rating.

New LTPP Tech Briefs Examine Pavement Rehabilitation and Maintenance Strategies

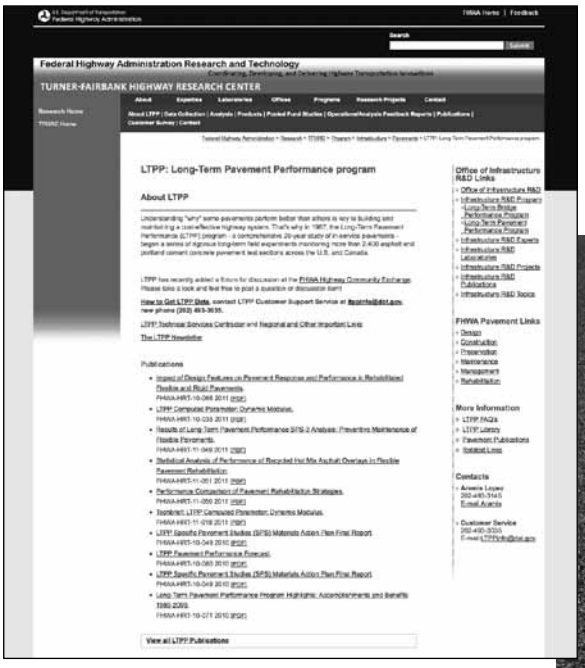
Three new Tech Briefs available from the Federal Highway Administration's (FHWA) Long Term Pavement Performance (LTPP) program present highlights from a recently released LTPP report on *Impact of Design Features on Pavement Response and Performance in Rehabilitated Flexible and Rigid Pavements* (Pub. No. FHWA-HRT-10-066).

Performance Comparison of Pavement Rehabilitation Strategies (Pub. No. FHWA-HRT-11-050) looks at rehabilitation strategies for both flexible and rigid pavements. The impact of overlay thickness, preparation prior to constructing an overlay, and mix type on performance are evaluated using data from the LTPP Specific Pavement Study (SPS)-5 and SPS-6 experiments. The 32 experiment sites included 18 rehabilitation projects that used asphalt concrete, 8 projects that featured asphalt concrete overlays over jointed plain concrete pavements, and 6 projects that used jointed reinforced concrete pavements. Sites were monitored for periods ranging from 8 to 17 years.

The performance evaluation included looking at outcomes for pavement smoothness and fatigue cracking and then developing a practical ranking of rehabilitation strategies from best to worst. Results, for example, indicated that thick overlays best improved the performance of rehabilitated asphalt concrete pavements with regard to smoothness and fatigue cracking. Results also showed that using virgin hot-mix asphalt (HMA) versus reclaimed asphalt pavement (RAP) did not have a significant effect on performance.

The performance evaluation included looking at outcomes for smoothness and fatigue cracking and then developing a practical ranking of rehabilitation strategies from best to worst.

Statistical Analysis of Performance of Recycled Hot Mix Asphalt Overlays in Flexible Pavement Rehabilitation (Pub. No. FHWA-HRT-11-051) compares the performance of RAP to virgin mixes in asphalt overlays constructed as part of the SPS-5 experiment. Performance was evaluated by examining load-associated distress, including roughness, rutting, and fatigue cracking. As the Tech Brief notes, "the performance data from LTPP SPS-5 shows that RAP and virgin HMA mixes used in overlays of flexible pavements showed approximately the same performance across a range of climates, traffic, and



For more information about the LTPP program, visit www.fhwa.dot.gov/pavement/ltpp.

LTPP pavement rehabilitation experiments included jointed concrete pavements.

The LTPP program's SPS-5 and SPS-6 experiments examined rehabilitation strategies for both flexible and rigid pavements.

existing pavement conditions over a period of up to 17 years."

An overview of the LTPP program's SPS-3 experiment is found in *Results of Long-Term Pavement Performance SPS-3 Analysis: Preventive Maintenance of Flexible Pavements* (Pub. No. FHWA-HRT-11-049). The SPS-3 experiment evaluated four preventive maintenance alternatives: thin HMA overlays, slurry seals, crack seals, and chip seals. These treatments focus on improving the pavement's functional performance and prolonging pavement life, rather than improving structural capacity.

Each SPS-3 site was also categorized according to five design factors:

- Moisture (wet or dry climate).
- Temperature (freeze or no-freeze zone).
- Subgrade type (fine grained or coarse grained).
- Traffic loading (low or high).
- Existing pavement condition (good, fair, or poor).

Thirty-three States and Canadian Provinces participated in the experiment, which included 81 sites. Performance was evaluated according to the deterioration measured by fatigue cracking, rutting, and roughness (using the International Roughness Index). Overall results indicated that chip seals and thin overlays had the highest levels of performance. All treatments were effective to some degree relative to the performance of the experiment's control section.

To download copies of the Tech Briefs or the full report, visit www.fhwa.dot.gov/research/publications/technical/infrastructure/pavements/ltpp. For more information on the LTPP SPS experiments, contact Larry Wiser at FHWA, 202-493-3079 (email: larry.wiser@dot.gov). To learn more about the LTPP program, visit www.fhwa.dot.gov/pavement/ltpp. ✻

Infrastructure Innovation Webinars

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

American Association of State Highway and Transportation Officials (AASHTO) Transportation Asset Management Guide (TAMP): Tools and Techniques for Implementing the TAMP
December 14, 2011, 2 p.m. (eastern standard time)

Hosted by AASHTO, the Webinar will discuss management systems, tools, and techniques described in the guide. To register, visit http://tam.transportation.org.

Time Is Money: Construction Project and Program Management Using Scheduling Software
December 15, 2011, 2:30–4 p.m. (eastern standard time)

Learn how scheduling software can be customized to manage most aspects of a highway construction project, including optimizing project timing and generating detailed data for performance measures. This Webinar is hosted by the Federal Highway Administration's (FHWA) National Highway Institute, in conjunction with the FHWA Highways for LIFE program. To register, visit www.fhwa.dot.gov/hfl/commtool.cfm. ✻

Your Guide to Work Zone Safety and Mobility Performance Measurement

How do roadway work zones in your city or State impact travelers, residents, businesses, and the local workforce? Find out how to better quantify the effects of work zones with the Federal Highway Administration's (FHWA) *A Primer on Work Zone Safety and Mobility Performance Measurement* (Pub. No. FHWA-HOP-11-033).

"Work zone performance measures help agencies improve their understanding of how their decisions during planning, design, and construction affect work zone safety and mobility, and thus can help improve how they make decisions for future work zones," said Tracy Scriba of FHWA.

As the primer notes, "work zone performance measurement should be driven by agency and other stakeholder needs and priorities. One advantage of establishing work zone performance measures is that it focuses attention on what is considered important to the agency and stakeholders."

The primer describes three basic types of performance measures that are useful in quantifying work zone safety and mobility impact. Exposure measures examine the amount of time, roadway space, or vehicle travel that a work zone affects or requires. Examples of exposure measures include the number of vehicles passing through the work zone and the average length of a lane closure in terms of distance. Safety measures assess how crash risk has changed for the individual motorist or for the traveling public in general, relative to the levels before the work zone existed. Potential safety measures include the percentage change in the crash rate compared to the expected crash rate when a work zone is not there. Finally, mobility (traffic operations) measures describe how travel mobility has been affected for motorists or other types of travelers. Examples of mobility measures include travel time and the average traffic queue duration and length.

Other types of mobility measures currently being used by States include the average speed of vehicles traveling through work zones, the percentage of work zones meeting agency expectations for traffic flow, and feedback received from customer surveys. The Missouri Department of Transportation, for example, has used online surveys that allow motorists to rate work zones.

The various work zone performance measures selected for use should:

- Relate to the safety and mobility goals and objectives that an agency has established for itself.
- Be consistent with the measures used in impact assessment efforts for work zone planning and design analyses.
- Characterize the different facets of impacts that are occurring.
- Enable an agency to evaluate the effects of alternative strategies for mitigating traffic impacts caused by work zones.
- Be compatible with other performance measures that an agency is using to evaluate its system.

"The idea of implementing a work zone performance measurement program can seem daunting if an agency thinks it must measure all work zones all the time," commented Scriba. "Agencies can still gain useful information from strategically monitoring a set of key work zones or focusing their measurements on key times, such as phase changes."

The primer also looks at how to define the data sources, collection techniques, and calculation methods that will be used to compute work zone performance measures. Agencies must balance the data needs for performance measures with available resources to determine the best data source or methodology. Data sources, for example, may range from manual documentation of traffic queues to portable work zone intelligent transportation systems to point-to-point travel time

Work zone performance measures help agencies improve their understanding of how their decisions during planning, design, and construction affect work zone safety and mobility.

Among the work zone performance measures that agencies can use are those that examine exposure, safety, and mobility.

measurement systems, such as automatic vehicle location technology. The primer discusses the advantages and disadvantages offered by these different sources.

For transportation departments just embarking on work zone performance measurement, the primer outlines key steps on how to make it happen in your agency. In addition to selecting performance measures and identifying data sources, important steps include identifying and engaging stakeholders, defining analysis requirements, and defining methods for disseminating results. For example, some agencies use "dashboard" displays of key measures on their Web sites, while others incorporate the results into an annual report.

A final step in the process is to review and refine measures as needed. Rather than a "one-and-done" activity, agencies should plan to revisit their work zone performance measurement program on a regular basis. "Changes in performance measurement needs, data sources, and knowledge and understanding of how to use the measures to improve agency operations will undoubtedly occur over time," said Scriba.

To download a copy of the primer or to view related materials on work zone performance measures, such as presentations and a recording from an October 2011 Webinar, visit www.ops.fhwa.dot.gov/wz/decision_support/performance-development.htm. For more information on work zone performance measurement, contact Tracy Scriba at FHWA, 202-366-0855 (email: tracy.scriba@dot.gov). *

Resources for Implementing LRFR,

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ed by the group found that 92 percent of States are using LRFR to rate bridges designed with the Load and Resistance Factor Design (LRFD) method, while 40 percent are using it to rate bridges designed with the American Association of State Highway and Transportation Officials' (AASHTO) Standard Specifications. Thirty-two percent of States have finalized State-specific policies and procedures to implement LRFR and 20 percent have developed draft policies and procedures.

A free LRFR Implementation Webinar Series launched by FHWA in October 2011 is focusing on priority topics for which States have requested more information. Held on October 5, 2011, the first Webinar highlighted Federal regulations and FHWA's expectations on load rating, the fundamentals of the LRFR method, and the Virginia Department of Transportation's experiences in implementing the LRFR method. More than 100 people participated in the Webinar, with 42 percent indicating that they had not used the LRFR method before.

A second Webinar held on November 17, 2011, concentrated on load rating for culverts. The Ohio Department of Transportation's experiences were featured, along with presentations from the concrete pipe, corrugated steel pipe, and plastic pipe industries. The series will continue in January 2012 with a Webinar discussing the load rating of segmental bridges.

Transportation agencies and others can also learn more about LRFR by scheduling a comprehensive training course available from FHWA's National Highway Institute (NHI), Load and Resistance Factor Rating for Highway Bridges (Course No. FHWA-NHI-130092A). The 2-day course provides both novice and experienced bridge engineers with the fundamental knowledge necessary to apply the most recent LRFR provisions specified in AASHTO's *The Manual for Bridge Evaluation* to bridge load rating. Topics covered include the purpose of performing a load rating, benefits of using the LRFR methodology, the LRFR process and general load rating equations, legal loads and their use in load rating, and LRFR limit states.

Participants will also learn how to determine distribution factors for load rating and select evaluation factors for rating, along with the process for load posting and procedures for checking overload permits. The course features load rating exercises that allow participants to demonstrate the application of LRFR requirements.

The course fee is $700 per person. The minimum number of participants is 20, with a maximum of 40. For more information or to schedule the course, visit www.nhi.fhwa.dot.gov.

LRFR is covered in more detail in a 4-day NHI course, Fundamentals of LRFR and Applications of LRFR for Bridge Superstructures (Course No. FHWA-NHI-130092). Additional topics include identifying material deteriorations that affect the load capacity of bridge components, applying load rating procedures for concrete slab bridges, and evaluating fatigue when load rating a steel girder bridge. The course fee is $1150 per person, with a minimum class size of 20 and a maximum of 40. For more details or to schedule the course, visit www.nhi.fhwa.dot.gov.

To obtain a recording of FHWA's LRFR Webinars or for more information on LRFR, contact Lubin Gao at FHWA, 202-366-4604 (email: lubin.gao@dot.gov). *

Highway Technology Calendar

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

Federal Highway Administration (FHWA) Intelligent Compaction (IC) National Workshop
December 13, 2011, Atlanta, GA

The workshop will highlight the fundamentals of IC and discuss the route to successful IC implementation. As the size of the free workshop is limited, registration is on a first-come, first-served basis.

Contact: Jennifer Rutledge at The Transtec Group, Inc., 512-451-6233, ext. 236 (email: jennifer@thetranstecgroup.com), or Lee Gallivan at FHWA, 317-226-7493 (email: victor.gallivan@dot.gov). Registration information is available at www.IntelligentCompaction.com.

US-92 Precast Concrete Pavement Systems Showcase
January 10, 2012, DeLand, FL

Precast concrete pavement systems are revolutionizing highway renewal and repair. Constructed off site and installed when traffic volume is low, the precast panels reduce traffic congestion caused by work zones, make the construction process safer, and increase roadway durability. The Florida Department of Transportation (FDOT) will be the first to use precast concrete pavement as an "unbounded overlay," which allows the existing pavement to remain in place, with no need for demolition and disposal and little or no need for repair or surface preparation. Sponsored by FHWA's Highways for LIFE program, in conjunction with FDOT, the showcase will include a half-day technical workshop, followed by a visit to the project site.

Contact: To register, visit www.t2events.ce.ufl.edu/assnfe/Ev.asp?ID=1606. For more information, visit www.fhwa.dot.gov/hfl/showcases/fl, or contact Mary Huie at FHWA, 202-366-3039 (email: mary.huie@dot.gov).

West Mesquite I-15 Interchange Project Showcase
January 10–11, 2012, Mesquite, NV

Sponsored by FHWA's Highways for LIFE program and hosted by the Nevada Department of Transportation, this showcase event will highlight innovative approaches for minimizing mobility impacts to I-15 traffic during replacement of the West Mesquite Interchange. Slide-in construction techniques will be used to place the new structure in less than 56 hours. The showcase is scheduled to include a site visit during the slide-in operation.

Contact: Timothy Cupples at FHWA, 202-366-1342 (email: timothy.cupples@dot.gov).

Transportation Research Board (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, the American Association of State Highway and Transportation Officials (AASHTO), and FHWA, conference topics will include asset management implementation; pavements and bridges; beyond pavements and bridges, featuring assets such as intelligent transportation systems and signs; and transit state of good repair.

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

2012 Design-Build in Transportation Conference
April 25–27, 2012, Phoenix, AZ

Join transportation leaders in discussing lessons learned in the use of the design-build project delivery method for transportation projects. The discussions will cover choosing the right delivery method, contracting approaches, risk allocation, and performance contracting. The conference is cosponsored by FHWA, AASHTO, and various industry groups.

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

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

Conference topics will include the detection, prediction, and mitigation of crack-

ing 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@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. A mini-symposium on concrete paving durability will be held the last day of the conference. The event is targeted at pavement, materials, and geotechnical engineering professionals, including Federal, State, and municipal engineers; consulting engineers; contractors; materials suppliers; and members of academia.

Contact: Shiraz Tayabji at Fugro Consultants, Inc., 410-302-0831 (email: stayabji@aol.com), or Sam Tyson at FHWA, 202-366-1326 (email: sam.tyson@dot.gov). Conference information is also available at www.fhwa.dot.gov/pavement/concrete/2012conf.cfm. *

Every Day Counts: FHWA Requests Information on Transportation Innovations

As part of its Every Day Counts (EDC) initiative, the Federal Highway Administration (FHWA) has issued a Request for Information (RFI) on innovations that have the potential to transform the way transportation agencies do business by shortening project delivery, enhancing roadway safety, and protecting the environment. Innovations should be proven, ready-to-go processes or technologies.

The EDC initiative focuses on both accelerating technology deployment and shortening project delivery. When identifying potential EDC innovations, FHWA considers the following:

- *Impact.* How the innovation will affect the transportation system.
- *Readiness.* How soon the impact of deploying the innovation can be realized.
- *Affordability.* How efficiently the innovation can be implemented and maintained.

- *Urgency and Scale.* Potential to positively impact the environment, safety, congestion, freight movement, construction techniques, contracting methods, project costs, maintenance, preservation, or emergency response.

FHWA welcomes suggested innovations from all sources. For more information or to submit a response, visit www.fhwa.dot.gov/everydaycounts/rfi. Responses must be submitted online by December 1, 2011. To learn more about current EDC initiatives and technologies, visit www.fhwa.dot.gov/everydaycounts. *

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FHWA Administrator: Victor M. Mendez

Managing Editor: Zachary Ellis • Tel: 202-493-3193 (fax: 202-493-3475) • Zachary.Ellis@dot.gov

Editor: Lisa Pope • Tel: 202-234-7157 (fax: 202-347-6938) lgpope@woodwardcom.com

Federal Highway Administration (HRTM)
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1420 N St., NW, Suite 102, Washington, DC 20005
fax: 202-347-6938; email: lgpope@woodwardcom.com

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