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INSIDE

3 SPMTs: Your guide to accelerated bridge construction

4 FHWA's 2008 Accelerated Bridge Construction Conference: On the fast track to success

5 A roadmap to transportation system preservation research

6 Highway technology calendar

7 Excellence in Highway Design 2008

8 Attend the SHRP 2 international symposium on nondestructive testing

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U.S. Department
of Transportation

**Federal Highway
Administration**

The ABCs of a Rapid Bridge Replacement in Utah

Accelerated bridge construction (ABC) techniques cut road closures and detours from 6 months to a single weekend and saved \$4 million in road user costs during the Utah Department of Transportation's (UDOT) recent replacement of the 4500 South bridge over the I-215 East Loop in Salt Lake City.

After evaluating project costs and user costs, UDOT decided that an ABC strategy was the best way to go. Championing the use of the new strategy were Shana Lindsey, UDOT's Director of Research and Bridge Operations, and Jim McMinimee, UDOT Director of Project Development, as well as the staff of UDOT's Salt Lake Region 2 office. "This innovation let us accomplish the

work that needed to be done and not impact the driving public," says Lindsey. The project was supported by \$1 million in funding from FHWA's Highways for LIFE program. "Highways for LIFE provided the seed money for the project, which enabled us to go ahead and use an accelerated strategy," says Lindsey.

Using prefabricated bridge elements, the superstructure of the new 4-lane, 52-m-long (172-ft), and 3-million-pound concrete and steel bridge was constructed offsite over a period of 4 months. Meanwhile, the abutments for the new bridge were constructed underneath the existing bridge without impacting traffic. The weekend installation

continued on page 2 >



The Utah Department of Transportation used self-propelled modular transporters (SPMTs) to install the prefabricated superstructure of the 4500 South bridge in Salt Lake City in October 2007.

Rapid Bridge Replacement,

continued from page 1

process began with closing I-215 to traffic at 9 p.m. on Friday, October 26, 2007. On Saturday morning, the old bridge was removed using self-propelled modular transporters (SPMTs). SPMTs are multi-axle, computer-controlled platform vehicles that can move bridge systems with precision to within a fraction of an inch. The vehicles can move in any horizontal direction, while maintaining their payload geometry and keeping equal axle loads. SPMTs also have vertical lift. Their use provides an efficient solution for bridge replacements on high-volume roads, reducing traffic disruptions and increasing worker safety. Because of the grade and slope of the site and terrain changes, UDOT's project was the most complex to use SPMTs to date in the United States.

On Sunday morning, the SPMTs were used again to lift the new bridge into place. "Both the removal and the installation went very well," says McMinimee. They also attracted considerable public interest and media attention, with thousands of spectators coming throughout the weekend to watch the innovative process. The road reopened on Monday morning, nearly 6 hours ahead of schedule. What would normally require 6 months of road closures and detours was accomplished in a single weekend.

Before embarking on the I-215 project and using SPMTs for the first time, UDOT conducted a scanning tour to other States that have used ABC techniques or SPMTs, including Louisiana, New York, and Florida. The tour allowed UDOT to ask questions and learn from other States' experiences, laying the groundwork for its project.

As part of the Highways for LIFE program and to provide a similar boost to others, UDOT invited neighboring Western States to come watch the bridge removal and installation and then stay for a 3-hour workshop on ABC and the use of SPMTs.



UDOT used SPMTs to remove the old 4500 South bridge (top). The superstructure of the new bridge was constructed offsite over a period of 4 months (bottom left). Following installation of the new bridge, I-215 reopened to traffic after a single weekend of work (bottom right).

The workshop attracted 150 highway agency representatives, contractors, and consultants.

While using SPMTs was an additional cost of nearly \$800,000, for UDOT this was offset by the reduced user costs. "UDOT is championing the idea of looking at total project costs that include road user costs," says McMinimee. "We spent more on construction but we saved road users \$4 million." "This project was also very important to gaining support in Utah for using innovative strategies," adds Lindsey. "It went exactly according to plan." From UDOT to area motorists and residents, the project was a success for the entire community.

The project's success has also brought momentum to planning accelerated bridge projects. For example, UDOT will use SPMTs to replace 13 bridges on I-80 in 2008. "The economy is tied directly to traffic flow," notes Lindsey. "We're using taxpayer dollars and everyone benefits when we use innovation to prevent lane closures and accomplish the work faster. It was a good thing to be able to bring the SPMT technology to Utah."

For more information on the 4500 South bridge removal and replacement, contact Daniel Hsiao at UDOT, 801-965-4638 (email: dhsiao@utah.gov). *

SPMTs: Your Guide to Accelerated Bridge Construction

Lift and drive your prefabricated new bridge to its final location in a matter of minutes with the use of self-propelled modular transporters (SPMTs). As the Federal Highway Administration (FHWA) details in its new *Manual on Use of Self-Propelled Modular Transporters to Remove and Replace Bridges* (Pub. No. FHWA-HIF-07-022), prefabricating bridges offsite under controlled conditions and then rapidly transporting them to their final destination for immediate erection can reduce traffic impacts to a matter of hours or a few days, rather than the months typically required for conventional onsite bridge construction. While in some cases initial construction costs can be higher, the off-setting savings from reduced construction time and user costs can be substantial. Offsite construction also increases worker safety.

SPMTs are multi-axle, computer-controlled platform vehicles that can move bridge systems weighing up to several thousand tons with precision to within a fraction of an inch. The vehicles can move in any horizontal direction and also have vertical lift. "This technology should be considered for all bridge replacement

projects where reduced onsite construction time is a priority," says Vasant Mistry of FHWA's Office of Bridge Technology. "More and more States are excited about using SPMTs." Using SPMTs for bridge moves was the top implementation recommendation of the 2004 Prefabricated Bridge Elements and Systems International Scan sponsored by FHWA, the American Association of State Highway and Transportation Officials (AASHTO), and the Transportation Research Board's National Cooperative Highway Research Program (NCHRP). The scan team observed the frequent use of SPMTs in European countries.

The manual includes sections on planning, design, benefits and costs, contracting issues, and contract documents. Among the topics covered are criteria to use in determining when the SPMT technology is appropriate, planning-related issues such as traffic considerations and site requirements, and design issues such as prefabrication requirements and allowable temporary stresses and deflections during the move. Contracting topics featured include staging area requirements and contracting strategies for reducing onsite construction time.

Also included are case studies of States and European countries that have used SPMTs to date, including the Florida Department of Transportation's replacement of the Graves Avenue Bridge in Volusia County in 2006 (see December 2006 *Focus*). Appendices feature sample plan sheets and specifications, including a sample specification for SPMT equipment and a user cost model spreadsheet.

The manual is the second in FHWA's series of publications on accelerated bridge construction, following the 2006 *Framework for Prefabricated Bridge Elements and Systems Decision-Making* (Pub. No. FHWA-IF-06-30). It is cosponsored by AASHTO, NCHRP, and the Florida Department of Transportation. "The new manual reflects the continued development of tools that States can use to accelerate their bridge construction," says Benjamin Tang of FHWA's Office of Bridge Technology.

For more information on the use of SPMTs or to obtain a copy of the manual, contact Vasant Mistry at FHWA, 202-366-4599 (email: vasant.mistry@fhwa.dot.gov). The *Framework for Prefabricated Bridge Elements and Systems Decision-Making* is available online at www.fhwa.dot.gov/bridge/prefab/framework.cfm. *



By using prefabricated bridge elements and SPMTs, the Florida Department of Transportation cut months off the project schedule for constructing the new Graves Avenue bridge in Volusia County in 2006.

FHWA's 2008 Accelerated Bridge Construction Conference: On the Fast Track to Success

Accelerating the deployment of innovative new technologies to significantly improve the driving experience of America's motorists is the goal of the Federal Highway Administration's (FHWA) upcoming 2008 Accelerated Bridge Construction—Highways for LIFE conference. Scheduled for March 20–21, 2008, in Baltimore, Maryland, the conference will provide a forum to exchange ideas and experiences within the bridge community's public and private sectors.

The conference will focus on case studies from around the world, with special emphasis on prefabricated bridge elements and systems, state-of-the-art equipment, material technologies, and innovative contracting methods. Session topics will include general issues and design, components and systems, seismic and substructure issues, composites, precast bridges, contract and design management, and decks and overlays.

“By the end of the conference, attendees should return to their States with working solutions to reduce onsite construction time, minimize traffic impacts, improve work zone safety, decrease environmental disruption, and make bridges more constructible,” says conference cochair Vasant Mistry of FHWA's Office of Bridge Technology. These solutions can also help increase quality and lower life-cycle costs.

Two preconference workshops scheduled for March 19 will highlight the American Association of State Highway and Transportation Officials' (AASHTO) Load and Resistance Factor Design (LRFD) bridge design specifications. The morning workshop, “Steel Bridge Design Using AASHTO/LRFD Specifications (2007 Edition),” will present background information on the LRFD steel design provisions, followed by short examples demonstrating their use. In the afternoon, “Con-

crete Bridge Design Using AASHTO LRFD Bridge Design Specifications (2007 Edition),” will look at LRFD concrete specifications, state-of-the-art concrete design procedures, and design examples.

The conference is cosponsored by 14 State departments of transportation from around the country. More than 400 attendees are expected, including engineers, design professionals, fabricators, contractors, members of academia, and representatives from Federal and local agencies. Registration for both the conference and workshops is free but preregistration is required, as space is limited. For more information or to register, visit www.fhwa.dot.gov/bridge/accelerated/index.cfm. Information is also available from Vasant Mistry at FHWA, 202-366-4599 (email: vasant.mistry@fhwa.dot.gov). *

The conference will focus on case studies from around the world, with special emphasis on prefabricated bridge elements and systems, state-of-the-art equipment, material technologies, and innovative contracting methods.



The superstructure for Rhode Island's Providence River bridge was prefabricated a dozen miles away and transported using two barges to the bridge site in August 2006, accelerating the construction process.

A Roadmap to Transportation System Preservation Research

What does the future hold for the Nation's transportation infrastructure? With increasing traffic volumes, aging highways and bridges, and budgets that cannot keep up with demands, transportation agencies face a growing number of challenges. Key to meeting these challenges and maintaining this vital infrastructure are preservation practices that can extend the service life of pavements and bridges. Agencies have enjoyed great success through the use of such practices, but progress is often hampered by gaps in the understanding and implementation of pavement and bridge preservation. "A concentrated effort is needed to conduct research to address these gaps and provide knowledge on how to apply the *right* preservation action at the *right* time to the *right* pavement or bridge," says Jim Sorenson of the Federal Highway Administration's (FHWA) Office of Asset Management.

Partnering with industry, the Transportation Research Board (TRB), and the American Association of State Highway and Transportation Officials (AASHTO), FHWA sponsored a study to identify critical knowledge gaps in pavement and bridge preservation and to determine the research needed to fill those gaps. The outcome of the study is the new *Transportation System Preservation Research, Development, and Implementation Roadmap*. Now available from FHWA, the Roadmap outlines 38 pavement preservation and 25 bridge preservation needs statements. The needs statements have been ranked and prioritized to facilitate their adoption into the short-term and long-term research funding programs of FHWA, TRB, and State transportation agencies.

"Taken together, these statements represent a potential wealth of new knowledge across a broad array of technical and policy areas," says Sorenson. "They provide a framework for a research manage-

ment plan to help direct application and implementation of the R&D results within the short- and long-term time frames."

Following a critical assessment of the state-of-the-art in preservation technology and infrastructure asset management, several broad topics in pavement preservation and bridge preservation were identified for in-depth study. In the pavements area, asset management and preservation, design, materials, concrete, construction, contracting methods, surface characteristics, and performance of preservation actions were examined. Bridge topics studied were asset management and preservation, bridge decks, bridge joints, concrete superstructures and substructures, steel superstructures and substructures, and selection and performance of preservation actions. White papers on each of the focus areas were then prepared by subject matter experts, summarizing the current knowledge on the topics and highlighting possible research and development needs.

The next step was to hold brainstorming workshops with transportation practitioners on pavement preservation and bridge preservation, so that participants could discuss and develop research needs statements addressing specific knowledge

gaps across all the topic areas. Workshop participants represented highway agencies, FHWA, TRB, industry, and academia. The pavement preservation workshops were held February 5–7, 2007, in Phoenix, Arizona, and February 26–28, 2007, in Orlando, Florida, while the bridge preservation workshop took place May 22–23, 2007, in Dallas, Texas. Following the workshops, the needs statements were refined, consolidated, and assessed for priority to produce the final list outlined in the Roadmap.

The top three pavement preservation needs identified are:

- Developing performance-related specifications for pavement preservation treatments.
- Determining pavement preservation treatments' lives and related pavement life extension.
- Determining the economic benefits of pavement preservation strategies.

continued on page 7 >

Key to meeting today's challenges and maintaining the Nation's vital infrastructure are preservation practices that can extend the service life of pavements and bridges.



FHWA's new Transportation System Preservation Roadmap outlines and prioritizes pavement preservation and bridge preservation research needs. Preservation practices that can extend the service life of pavements and bridges, such as the chip seal for pavements shown here, are more important than ever as the Nation's infrastructure ages.

Highway Technology Calendar

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

Transportation Research Board (TRB) 87th Annual Meeting

January 13–17, 2008, Washington, DC

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 Annual Meeting Web site at www.trb.org/meeting. Questions about the meeting can be emailed to TRBMeetings@NAS.edu.

2008 Accelerated Bridge Construction Conference: Highways for LIFE

March 20–21, 2008, Baltimore, MD

The conference will provide a forum for both public and private sector members of the bridge community to exchange ideas and experiences related to accelerated bridge construction. Cosponsored by the Federal Highway Administration (FHWA) and 14 State transportation departments from across the United States, the conference is designed for State highway bridge engineers, design professionals, fabricators, contractors, members of academia, and representatives of Federal and local agencies. The conference will focus on case studies that emphasize prefabricated bridge elements and systems, state-of-the-art equipment, material technologies, and innovative contracting methods that enable accelerated bridge construction.

Contact: Vasant Mistry at FHWA, 202-366-4599 (email: vasant.mistry@fhwa.dot.gov), or visit www.fhwa.dot.gov/bridge/accelerated/index.cfm.

Seventh International Conference on Managing Pavement Assets (ICMPA)

June 24–28, 2008, Calgary, Canada

The 2008 ICMPA will offer transportation agencies and others the opportunity to learn about pavement management practices from around the world. Topics will include asset preservation and maintenance, asset management tools, data collection and management, and performance-based planning.

Contact: For more information, send an email to ICMPA2008@eventplan.net, or visit www.icmpa2008.com.

Fourth International Conference on Bridge Maintenance, Safety, and Management

July 13–17, 2008, Seoul, Korea

The conference will address such topics as bridge management systems, design and analysis, reliability and risk management, fatigue analysis, measurement and monitoring, and damage assessment. The event is being organized by the International Association for Bridge Maintenance and Safety and hosted by the Korea Bridge Design and Engineering Research Center at Seoul National University.

Contact: Ian Friedland at FHWA, 202-493-3023 (email: ian.friedland@fhwa.dot.gov), or visit www.iabmas08.org.

International Construction Management Conference

September 8–11, 2008, Orlando, FL

The conference will look at such topics as alternative procurement and contracting systems, construction cost escalation, public-private partnerships, and risk management. The conference is sponsored by

the Construction Management Expert Technical Group, which includes representatives from the American Association of State Highway and Transportation Officials (AASHTO), FHWA, industry, and academia.

Contact: Jerry Yakowenko at FHWA, 202-366-1562 (email: gerald.yakowenko@fhwa.dot.gov).

Second National Maintenance Quality Assurance (MQA) Peer Exchange

September 23–24, 2008, Durham, NC

Participants will discuss MQA analysis procedures and reporting to support highway decisionmaking and will identify progress made since the first Peer Exchange was held in 2004. The event's goals also include developing a glossary of commonly used terms for MQA concepts and updating the MQA document library. Sponsored by FHWA's Office of Asset Management, the Peer Exchange is being held in conjunction with the National Workshop on Highway Asset Inventory and Data Collection.

Contact: Jennifer Brandenburg at the North Carolina Department of Transportation (NCDOT), 919-733-3725 (email: jbrandenburg@dot.state.nc.us).

National Workshop on Highway Asset Inventory and Data Collection

September 24–26, 2008, Durham, NC

The workshop will highlight the latest in technology for managing highway assets. Four focus areas will be featured: Pavements, Bridges, Roadside Appurtenances, and Geotechnical and Drainage. The workshop is cosponsored by TRB, FHWA, and AASHTO.

Contact: Terry Canales at NCDOT, 919-733-2210 (email: tcanales@dot.state.nc.us). *

Excellence in Highway Design 2008

The Federal Highway Administration's (FHWA) biennial Excellence in Highway Design Awards Program recognizes outstanding examples of highways, bridges, and other facets of roadway design. FHWA's Office of Program Administration will begin accepting nominations on January 14, 2008, for the 2008 awards. Organizations will be recognized for superior work on projects substantially completed or programs implemented from July 1, 2006, to March 1, 2008.

Details on the award categories and criteria and nomination forms will be available online in early January at www.fhwa.dot.gov/eihd. The deadline for nominations is March 1, 2008. For more information, contact Brooke Struve at FHWA, 202-366-1317 (email: brooke.struve@fhwa.dot.gov). *



Transportation System Preservation, continued from page 5

The top three priorities for bridges are:

- Improving inspection techniques for steel prestressing strands, cables, and ropes.
- Quantifying the information necessary to guide bridge preservation decisions.
- Identifying best practices for preserving bridge decks.

Key issues highlighted by both pavement preservation and bridge preservation workshop participants include the importance of obtaining reliable, usable data on the degree of preservation that is accomplished by applying a particular treatment; the cost of the treatment; and how long the treatment remains effective. Also highlighted at the workshops were the difficulty in determining optimum timing for applying preservation treatments and the lack of standard terminology and definitions for preservation, particularly for bridge preservation. Practitioners also noted that preservation outreach and training (at the agency, contractor, and university levels) is a key component to increasing the acceptance and awareness of preservation among transportation agencies, decisionmakers, and the public.

For more information or to obtain a copy of the Roadmap, contact Chris Newman at FHWA, 202-366-2023 (email: christopher.newman@fhwa.dot.gov). The Roadmap will be posted online in January 2008 at www.pavementpreservation.org. *

To learn more about transportation system preservation, visit www.fhwa.dot.gov/preservation.

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FHWA Administrator:

J. Richard Capka

Managing Editor: Zachary Ellis

Tel: 202-493-3193 (fax: 202-493-3475)

zachary.ellis@fhwa.dot.gov

Editor: Lisa Pope

Tel: 202-234-7157 (fax: 202-347-6938)

lgpope@woodwardcom.com

Federal Highway Administration (HRTM)

6300 Georgetown Pike

McLean, VA 22101-2296

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Send address corrections to:

Woodward Communications

1420 N St., NW, Suite 102

Washington, DC 20005

fax: 202-347-6938

email: lgpope@woodwardcom.com



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Attend the SHRP 2 International Symposium on Nondestructive Testing

The Strategic Highway Research Program 2 (SHRP 2), in cooperation with the Forum of European National Highway Research Laboratories, is sponsoring an International Symposium on Nondestructive Testing for Design Evaluation and Construction Inspection. The symposium will be held January 18, 2008, at the Marriott Wardman Park Hotel in Washington, DC, immediately following the Transportation Research Board's (TRB) 87th Annual Meeting.

The symposium is designed to gather international feedback as SHRP 2 plans a program of research and development for nondestructive testing (NDT) applied to highway design and construction inspection. A preliminary plan for developing NDT procedures will be discussed at the symposium.

Symposium attendees will have the opportunity to provide input on the plan and the direction of the SHRP 2 research and will also be better prepared to respond to subsequent requests for proposals for the NDT research.

The symposium is free, but registration is required. To register, visit www.trb.org.shrp2/SHRP2II_Renewal.asp. For more information on the SHRP 2 plan for developing high-speed NDT procedures, visit <http://onlinepubs.trb.org/onlinepubs/SHRP2/R06.pdf>. For more information on the symposium, contact Monica Starnes, Senior Program Officer for SHRP 2 at TRB, 202-334-1894 (email: mstarnes@nas.edu). To learn more about SHRP 2, visit www.trb.org/SHRP2. *

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