

FOCUS

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Scanning the Country for Best Practices in Accelerated Construction

After Hurricane Ivan destroyed the I-10 Escambia Bay Bridge in Florida in 2004, the west-bound bridge reopened to two-way traffic in 17 days and the east-bound bridge reopened in 63 days, allowing for normal traffic separation on the bridge to resume. In California, meanwhile, the local media declared it “A-Maze-ing” in 2007 when the San Francisco Bay Area’s freeway interchange known as “The Maze” completely reopened to traffic 26 days after a gasoline tanker truck fire destroyed the interchange bridge. From coast to coast, accelerated construction practices are cutting project schedules from years to sometimes mere weeks or days, resulting in reduced traffic congestion and delays, increased mobility, and improved customer satisfaction.



Accelerated construction practices being used as part of California's San Francisco-Oakland East Bay Bridge project include a planned replacement of a 91-m-long (300 ft) double-deck section of the bridge's East span over Labor Day weekend in September 2009.

A 2009 Domestic Scan of Accelerated Construction Practices sponsored by the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA) documented case studies that demonstrate how projects can be successfully delivered much more rapidly. “The goal of the scan was to focus on construction practices that are underlying fundamentals for successfully accelerating construction work processes, as well as those management practices that provide the environment to enable accelerated construction,” says scan team co-chair Chris Schneider of FHWA.

The scan team included representatives from FHWA, State transportation agencies, a

State turnpike authority, and academia. In March 2009, team members visited Jacksonville and Pensacola, Florida; Birmingham and Montgomery, Alabama; Houston, Texas; Salt Lake City, Utah; and Sacramento and Oakland, California, to learn about best practices for accelerating construction projects. Both pavement construction and bridge construction projects were studied. Discussions on the following topics were held with transportation agency staff, consulting engineers, contractors, and suppliers:

- General program-level issues.
- Contracting strategies and contract administration.

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Best Practices in Accelerated Construction,

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- Planning and scheduling.
- Construction practices, including cost, time, and quality.
- Traffic control management.
- Postconstruction issues.

“The scan opened my eyes to many ways to successfully deliver a project even when the schedule must be compressed,” says team member Clifford Schexnayder of Arizona State University. In addition to examining such emergency projects as the I-10 Escambia Bay Bridge in Florida and California’s reconstruction of “The Maze” in Oakland, the team looked at planned projects, where an acceleration strategy was selected intentionally by the transportation agency to minimize disruption to highway users. “Many of the transportation departments we visited told us that they have taken the lessons learned from their emergency accelerated projects and are now applying them to other projects,” noted Schexnayder. The planned projects studied included the rehabilitation of the I-15 Devore Corridor in California. The California Department of Transportation analyzed four road closure scenarios for this high-traffic corridor prior to construction to find the most economical option and to ensure that schedule, traffic impact, and agency costs were all considered.

Team members also found in talking with Utah Department of Transportation (UDOT) staff that the agency has gone beyond emergency and planned projects to embrace a program approach to accelerated construction. The program approach allows



The new I-10 Escambia Bay Bridge in Pensacola, FL. The bridge was reconstructed in 63 days after being destroyed by Hurricane Ivan in 2004.

UDOT to more efficiently accelerate similar project types, such as bridge construction. UDOT’s Accelerated Bridge Construction program has completed 17 projects involving 80 bridges, some of which disrupted traffic for only a weekend.

The scan’s key findings include a range of best practices in the areas of partnering, design, planning, and contracting strategies. In all of the case studies examined, partnering proved to be a critical element. “For a project to succeed, it is important for all team members, including transportation agency staff, contractors, and materials suppliers, to demonstrate a high level of attention to detail and be committed and empowered to resolve issues at the lowest level,” says Schneider. “Goals of the team members should also be aligned.” In the area of design, meanwhile, project designers should review the opportunities available to remove barriers to acceleration.

For example, material availability and handling logistics should be considered in the early stages of design, as contractors must be able to procure all necessary materials promptly. “Consideration of constructibility is very important,” noted Schexnayder. Using a design that allows for repetition of activities also helps to accelerate the work.

“The scan opened my eyes to many ways to successfully deliver a project even when the schedule must be compressed.”



Best practices highlighted by the accelerated construction scan include success stories in the areas of partnering, design, planning, and contracting strategies.

Speed is also achieved by planning work that can be done concurrently and attacking a project on multiple fronts. A detailed execution plan is critical. This plan should be updated regularly, with materials suppliers and fabricators included in the process. Contingency plans that address possible impediments to the project must also be prepared.

Another key to a successful project is the contracting strategy. The contracting method needs to be aligned to the project’s technical requirements, including the time allotted for completion, type of work, traffic conditions, and site conditions. Such strategies as design-build contracting or the construction manager/general contractor (CMGC) approach can facilitate both innovation and acceleration. Using CMGC allows an agency to



A rubber tire loader in action during the construction of the San Francisco-Oakland East Bay Bridge project in California.

participate in the project's design phase, for example, while obtaining critical constructibility input from the contractor.

Team members noted that accelerated construction means championing a new business model of serving the public. "When a transportation department involves the community and local authorities and is able to align their goals with the project goals, accelerated construction can not only succeed but can reduce the overall costs to the community and improve customer satisfaction," says Schneider.

To learn more about the accelerated construction practices domestic scan, contact Chris Schneider at FHWA, 202-493-0551 (email: christopher.schneider@fhwa.dot.gov). The scan team's final report, *Domestic Scan of Accelerated Construction Practices Scan 07-02*, will be available online at www.trb.org in December 2009 (search under "NCHRP 20-68A, U.S. Domestic Scan Program"). Information on accelerated construction is also available by contacting Rob Elliott in the FHWA Resource Center, 404-562-3941 (email: rob.elliott@fhwa.dot.gov), or visiting www.fhwa.dot.gov/construction/accelerated. *

Moving Forward with Long Term Bridge Performance

The Federal Highway Administration's (FHWA) Long Term Bridge Performance (LTBP) program continues to move forward in advancing knowledge of bridge performance. The field work on the program's first pilot project will begin on a bridge on U.S. Route 15 over I-66 in Haymarket, Virginia, in September 2009. Designated under the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), the 20-year or longer LTBP research program will conduct detailed inspections of, evaluate, and periodically monitor a representative sample of bridges nationwide using proven sensor technology. These bridges will represent many structural types and materials and a variety of conditions, exposures, and locations. The data collected by the program will

lead to better understanding of bridge deterioration, improved design methods, and more effective preservation, maintenance, and repair strategies.

Launched in 2008, the first phase of the program included identifying the relevant data types to be collected; establishing an architecture that utilizes open and scalable data management and data analysis infrastructure; and developing protocols for data sampling, collection, and quality assurance. Also developed were the methodology and rationale for sampling bridges for long-term monitoring so that they are representative of the nearly 600,000 U.S. bridges on public roads contained in the National Bridge Inventory database, as well as protocols for testing, monitoring, and conducting bridge autopsies.

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The Long Term Bridge Performance program's first pilot project will be held on a bridge on U.S. Route 15 over I-66 in Haymarket, VA.



Value Engineering: Strategies for Success

The Federal Highway Administration's (FHWA) *Fiscal Year 2008 Value Engineering Accomplishment Report* identifies successful practices States across the country are using to enhance and improve their value engineering (VE) programs. In 2008, VE studies and proposals resulted in more than \$2 billion in savings on transportation projects.

VE is a process that reexamines a transportation project's design plan, so as to improve the design's safety, quality, and functionality, while also reducing the cost. The VE process can also shorten project times, encourage innovation, lower life-cycle costs, and improve quality. "A successful VE program includes well-established policies and practices that fully integrate VE into the project development process and continue to encourage innovation during the construction process," says Jeffrey Zaharewicz of FHWA. "Successful VE programs also train staff and raise awareness at all levels within the

organization of the benefits of applying VE techniques."

In 1995, Congress first instructed the U.S. Secretary of Transportation to establish a program requiring that State departments of transportation conduct VE studies on all National Highway System projects with a cost of \$25 million or more. In August 2005, the passage of the Safe, Accountable, Flexible, Efficient, Transportation Equity Act: A Legacy for Users (SAFETEA-LU) modified the statute language to require a VE analysis for each project on the Federal-aid system (defined as the Interstate System and the National Highway System) with an estimated total cost of \$25 million or more; a bridge project with an estimated total cost of \$20 million or more; and any other project the Secretary of Transportation determines to be appropriate.

Best practices identified in the *Fiscal Year 2008 Value Engineering Accomplishment Report* include those in the area of scheduling, coordinating, and conducting

VE studies. Several States, for example, are utilizing flexibility in how they accomplish their VE evaluations. The California Department of Transportation (Caltrans) holds a VE workshop that is split into two 3-day sessions, with a gap of typically 1 week in between. The result for Caltrans has been better time management for VE team members, including allowing time to gather necessary project information between sessions. The Missouri Department of Transportation, meanwhile, conducts streamlined studies known as VE/Practical Design Reviews. Ranging from 2 hours to 2 days, the abbreviated studies are typically conducted during the final design stage to ensure value is optimized.

"One of the hallmarks of the VE process is the creativity that can be exhibited by the multidisciplinary VE study teams," says Zaharewicz. Several States noted that a more functionally diverse VE team leads to a more successful VE study. The New Jersey Department of Transportation, for example, invites local authorities to participate in many of their studies, providing municipalities an opportunity to discuss their project needs and priorities.

In terms of the timing for VE studies, an increasing number of States are opting to conduct the study prior to the completion of preliminary designs (less than 30 percent of design completed) for design-bid-build projects. Several States connect the timing of their VE studies to the environmental compliance process.

When applying VE to design-build projects, several States also use the 30 percent design milestone. The Georgia Department of Transportation (GDOT) is among the agencies that conduct their VE studies in the same manner for both



Value engineering can shorten project times, lower life-cycle costs, and improve quality.

design-bid-build and design-build projects. GDOT also shares the results of its VE studies with the contracting firms that have been shortlisted as project candidates.

For major projects costing more than \$500 million, a few States described their process for conducting multiple studies. For example, Pennsylvania would conduct three VE studies, timed at the 30 percent, 60 percent, and 90 percent design stages. Nevada, meanwhile, would conduct its first VE analysis at the development phase to help minimize project impacts. A second study would then be performed in the intermediate design phase to address issues such as geometrics, drainage, roadbed design, and structure details, and fine-tune the project before making the final right-of-way decisions.

The accomplishment report also details other ways States are applying the VE process, beyond just the design of transportation projects. Montana, for example, has used VE to develop recommendations for its Interstate rehabilitation process, while Wisconsin performed a freeway maintainability review using an accelerated VE format. The New York State Department of Transportation (NYSDOT) has conducted several VE studies dedicated to work zone safety. Unlike traditional VE studies, savings were measured in safety enhancements rather than dollars. VE team members included representatives from NYSDOT, the State police, the construction industry, and FHWA.

Several States maintain ongoing VE training and education programs.

Training approaches range from National Highway Institute workshops to design academies to Web-based courses. In 2008, a total of 531 professionals nationwide received training in VE, comprising 405 State transportation agency representatives, 11 FHWA representatives, and 115 professionals from other organizations.

For the 2008 report, States were also asked to share information regarding successful practices that encourage implementation of VE change proposals (VECP) after the award of construction contracts. The Iowa Department of Transportation is one of several State transportation agencies seeking ways to increase industry awareness of the VECP process, with a standard note included on construction plans that directs contractors to a general VE specification. Elsewhere, the Florida Department of Transportation (FDOT) reported that VECPs are now a standing agenda topic for its preconstruction and quarterly contractor meetings. This allows contractors to discuss their VE proposals with FDOT staff before many funds have been spent on construction. The Wisconsin Department of Transportation, meanwhile, has presented VECP information at various industry forums.

To download the *Fiscal Year 2008 Value Engineering Accomplishment Report*, visit www.fhwa.dot.gov/ve/2008. For more information on VE, contact Jeffrey Zaharewicz at FHWA, 202-493-0520 (email: jeffrey.zaharewicz@fhwa.dot.gov). *

Highways for LIFE Seeks Stakeholder Input

Tell us what you really think. The Federal Highway Administration's (FHWA) Highways for LIFE (HfL) program wants your input on the program's future direction. HfL is designed to accelerate the adoption of innovations and new technologies, thereby improving highway safety and quality while reducing congestion caused by construction. To provide feedback on the program, visit www.fhwa.dot.gov/hfl and click on "Stakeholder Input Requested." Comments on the following questions can also be emailed to HFLT@dot.gov:

1. What do you see as the most successful elements of the current HfL program that should be continued?
2. Are there particular areas within the current HfL program that you think should have more emphasis than they have had previously?
3. Do you feel that the HfL concept needs to be expanded into other areas or focused more narrowly?
4. Where do you think the HfL program needs to go next?

Additional comments and suggestions are also welcome. More information on HfL is available at www.fhwa.dot.gov/hfl. *

Conference to Feature Sustainable Technologies for Concrete Pavements

From raw material production to long-term maintenance, the International Conference on Sustainable Concrete Pavements will highlight current practices, challenges, and the future direction of building more sustainable concrete pavements. Scheduled for September 15–17, 2010, in Sacramento, California, the conference is being organized by the Federal Highway Administration (FHWA) and National Concrete Pavement Technology Center as part of the technology transfer efforts of FHWA's Advanced Concrete Pavement Technology Products Program.

With increased attention being paid to the importance of balancing the economic considerations and engineering strategies of infrastructure development with the need for environmental stewardship, the conference will examine how sustainability-related considerations can be integrated throughout the life cycle of a pavement, including design and engineering, material selection, construction, and service life. "This will be a great opportunity to showcase what we can do to be responsible about sustainable construction practices. The adoption of sustainable design, construction, and preservation practices is an important strategy to meet the highway



Long-life concrete pavement under construction along a section of I-90 near Syracuse, NY.

needs of the present without compromising the ability of future generations to meet their needs," says conference co-chair Shiraz Tayabji of Fugro Consultants, Inc.

The conference will feature existing technologies, emerging research, approaches for measuring the energy and environmental impact of construction, user considerations, and international practices and experiences. Topics will include:

- Sustainable strategies for concrete pavements.
- Sustainable concrete materials.
- Optimizing concrete mixture design procedures that result in sustainable concrete pavements.
- Optimizing pavement design procedures that result in sustainable concrete pavements.
- Construction practices for sustainable concrete pavements.
- Sustainable pavement preservation, rehabilitation, and recycling strategies for managing concrete pavement networks.

- Adoption and implementation of environmental life-cycle assessments for sustainable concrete pavements.
- Identification and quantification of environmental and social considerations for sustainable concrete pavements.
- Sustainable concrete pavements in the urban environment.
- Next-generation materials and techniques for concrete pavements.

Papers are currently being solicited on each of the conference topics, as well as emerging issues related to the topics. Abstracts for papers must be submitted by October 1, 2009. For more information on the conference or details on how to submit an abstract, visit www.fhwa.dot.gov/pavement/concrete/2010acptpconf.cfm. Information on the conference is also available from Shiraz Tayabji at Fugro Consultants, Inc., 410-997-9020 (email: stayabji@aol.com), or Sam Tyson at FHWA, 202-366-1326 (email: sam.tyson@fhwa.dot.gov). *



Sustainable strategies applied to the concrete pavement construction on I-90 included the use of fly ash in the concrete.

Highway Technology Calendar

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

Precast/Prestressed Concrete Institute (PCI)/Federal Highway Administration (FHWA) National Bridge Conference

September 12–15, 2009, San Antonio, TX

The conference will present state-of-the-art information on precast concrete design, fabrication, and construction. Featured topics will include accelerated construction, designing for seismic forces, high-performance concrete, and innovative precast concrete structures.

Contact: Myint Lwin at FHWA, 202-366-4589 (email: myint.lwin@fhwa.dot.gov), or visit www.pci.org (click on “News and Events” and then select “PCI–FHWA National Bridge Conference”).

Eighth National Conference on Transportation Asset Management: Putting the Asset Management Pieces Together

October 19–21, 2009, Portland, OR

The conference will highlight emerging issues in transportation asset management, including trade-off analysis, optimization, system management, and safety. Three thematic tracks will be featured: Safety, Pavement Management, and Data and Information Infrastructure. Practical examples of asset management implementation within a State, region, or local community will also be spotlighted.

Contact: Tom Palmerlee at the Transportation Research Board (TRB), 202-334-2907 (email: tpalmerlee@nas.edu); or Francine Shaw-Whitson at FHWA, 202-366-8028 (email: francine.shaw-whitson@fhwa.dot.gov).

Fourth Asphalt Shingle Recycling Forum

November 5–6, 2009, Chicago, IL

Hosted by the Construction Materials Recycling Association, forum sponsors also include the Asphalt Roofing and Manufacturers Association, Owens Corning, FHWA, U.S. Environmental Protection Agency, National Roofing Contractors Association, and the National Asphalt Pavement Association. Three roundtables will be held on November 5 for transportation agency officials; environmental officials; and shingle recyclers, hot-mix asphalt producers, and other industry partners.

Contact: Audrey Copeland at FHWA, 202-493-0341 (email: audrey.copeland@fhwa.dot.gov), or visit www.shinglerecycling.org.

World Steel Bridge Symposium

November 17–20, 2009, San Antonio, TX

Organized by the National Steel Bridge Alliance (NSBA) and FHWA, the symposium brings together steel bridge owners, designers, and contractors from around the world to discuss all aspects of steel bridge design and construction.

Contact: Elizabeth Robelet at the American Institute of Steel Construction, 312-670-5421 (email: robelet@aisc.org). Information is also available at www.steelbridges.org.

TRB 89th Annual Meeting

January 10–14, 2010, Washington, DC

More than 3,000 presentations in nearly 600 sessions will spotlight current developments in transportation research, policy, and practice. The theme for the 2010 meeting is “Investing in Our Transportation Future—Bold Ideas to Meet Big Challenges.”

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.

First International Conference on Pavement Preservation

April 12–16, 2010, Newport Beach, CA

An array of pavement preservation issues will be featured at the conference, including benefits of pavement preservation, treatments for flexible and rigid pavements, strategy selection, integration of pavement preservation into pavement management systems, promotion of pavement preservation to the public and elected officials, and funding.

Contact: Chris Newman at FHWA, 202-366-2023 (email: christopher.newman@fhwa.dot.gov). For more information, visit www.pavementpreservation.org/icpp.

International Conference on Sustainable Concrete Pavements: Practices, Challenges, and Directions

September 15–17, 2010, Sacramento, CA

The conference will present innovative processes for achieving sustainable concrete pavements throughout the pavement’s life cycle. Topics will include existing technologies, emerging research, approaches to measuring energy and environmental impact, user considerations, and international practices and experiences. Case studies from around the world will also be presented. The conference is being organized by FHWA and the National Concrete Pavement Technology Center as part of the technology transfer efforts of FHWA’s Advanced Concrete Pavement Technology Products Program.

Contact: Shiraz Tayabji at Fugro Consultants, Inc., 410-997-9020 (email: stayabji@aol.com); or Sam Tyson at FHWA, 202-366-1326 (email: sam.tyson@fhwa.dot.gov). Information is also available online at www.fhwa.dot.gov/pavement/concrete/2010acptpconf.cfm. *

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Long Term Bridge Performance,

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Focus group meetings were held with State transportation agencies around the country to determine which aspects of bridge performance were the highest priorities for States. "The major findings from the focus group meetings were remarkably similar from State to State. Around the country, regardless of the geographic region, bridge performance issues related to concrete bridge decks and joints were high on the list of priorities for each State department of transportation," says Hamid Ghasemi, Manager of the LTBP program at FHWA.

The pilot study phase of the program is designed to validate the methods and protocols developed during the first phase, with seven States selected to represent the many environmental conditions experienced throughout the United States. In addition to Virginia, the States participating in the pilot program are California, Florida, Minnesota, New Jersey,

New York, and Utah. The pilot program is expected to last 2 years.

"While the pilot study will focus heavily on the validation of the protocols, methods, and guidelines for data collection, the pilot bridges will not be viewed as independent from the long-term data collection phase of the program, which will include detailed inspection and monitoring of a much larger population of bridges nationwide," says Ghasemi. "It is important that the selection, instrumentation, and data collection of the pilot bridges be consistent with the objectives of the long-term data collection phase, so that the information gathered during the pilot study will provide early results to bridge performance questions."

For more information on the LTBP program, visit www.tfhr.gov/ltpb, or contact Hamid Ghasemi at FHWA, 202-493-3024 (email: ltpb@dot.gov). *

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