

FOCUS

October
2007

INSIDE

Help desk
offers pavement
preservation
assistance

Better transportation
planning in Cincinnati
through economic
analysis

Highway
technology
calendar

Seeking the Best
Solutions with
Highways for LIFE

Seventh International
Conference on
Managing Pavement
Assets: Investing
in the future

Optimizing Your Highway Construction Operations: What Can HIPERPAV II Do for You?

As highway agencies and contractors face the constant challenge of cost-effectively optimizing their highway construction operations and improving the quality of the final product, the Federal Highway Administration's (FHWA) free High Performance Concrete PAVING (HIPERPAV®) II software can provide quick and valuable assistance in achieving this balanced goal. The software can also be used to conduct forensic studies of premature pavement distress.

HIPERPAV was first developed in 1996 for use in predicting the early-age behavior of jointed plain concrete pavements (JPCP). FHWA's goal was to provide a total systems approach to simulate potential problems associated with concrete paving before they happen. The software was designed for use by State and local highway agencies, contractors, suppliers, and members of academia. Enhancements added to HIPERPAV II include prediction models for the early-age behavior of continuously reinforced concrete pavements (CRCP) and the effect of early-age behavior factors on long-term JPCP performance.

HIPERPAV II models the impact of specific construction operations, concrete batch proportions, geometric design, concrete properties, and environmental factors on early-age pavement strength and stress development during construction. These combined factors, along with traffic loading, affect

the overall long-term performance of the pavement. To run the program, users must enter information on such variables as the pavement width, depth, joint spacing, batch proportioning, cement type, and concrete strength, as well as environmental factors. The environmental factors include hourly air temperature, relative humidity, wind speed, and cloud coverage for the first 72 hours after

concrete placement. These data can be entered based on the 3-day weather forecast or by using a 30-year historical weather database built into the software. Additional inputs, such as the concrete modulus of elasticity, coefficient of thermal expansion, ultimate shrink-

age, and axial restraint at the base-slab interface, can either be estimated based on material types or entered by the user for a more precise analysis.

After the data is entered, a baseline file can be developed with the essential data in approximately 30 minutes. This file can be copied multiple times for quicker analysis in the future. Well in advance of construction, multiple concrete batch proportions can be analyzed with projected construction scenarios and environmental conditions. On the day before or the day of construction, placement time, concrete and base temperature, curing type and application time, and saw-cut time can be analyzed using more accurate geometric, batch, and environmental details.

**The end result
is money saved
and increased
profits.**

www.tfhrc.gov/focus/focus.htm



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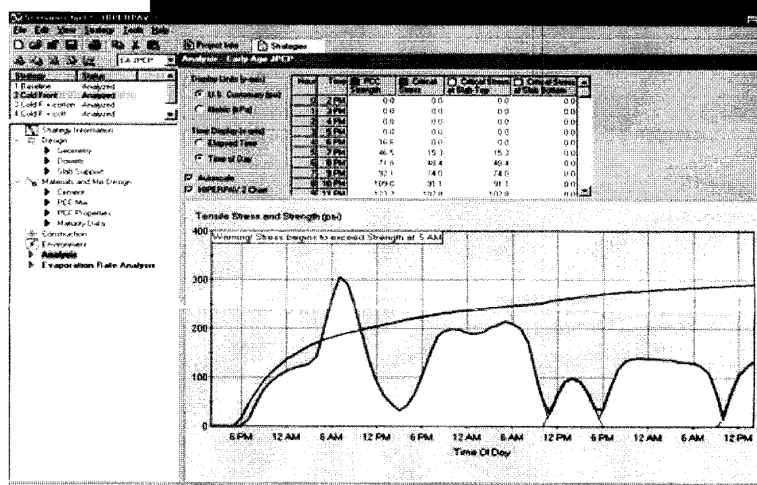
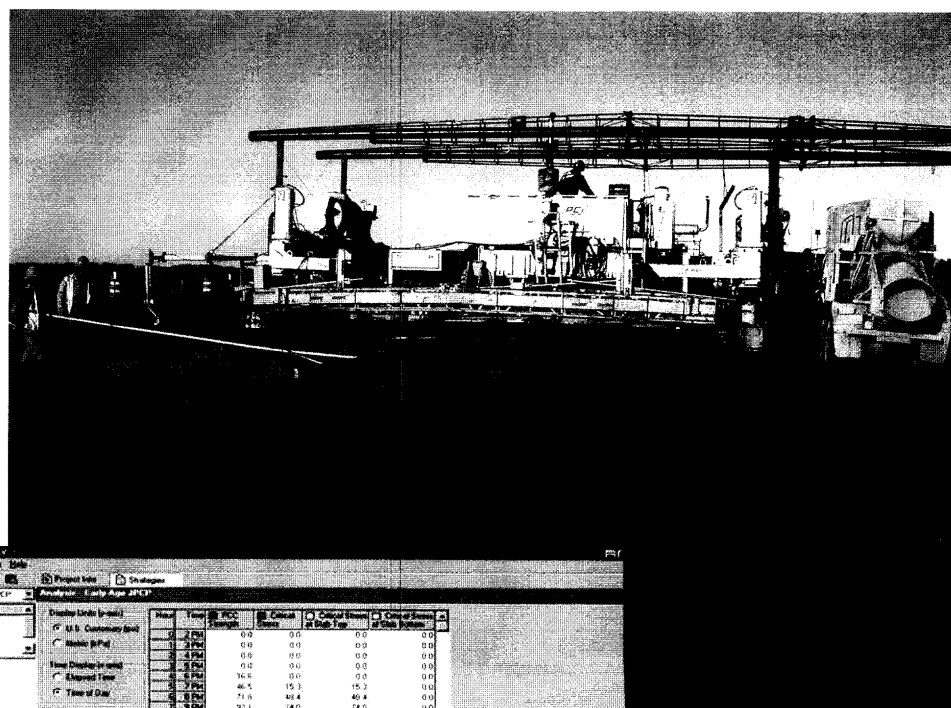
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HIPERPAV II, continued from page 1

A recent FHWA survey of HIPERPAV users found that most customers find the software useful for approximating the best time to place concrete in undesirable conditions such as cold or hot weather, as well as for situations where they are required to use high proportions of slag cement or where paving must be done on an unfamiliar base type. Other customers noted that they are using the software as a forensic tool to troubleshoot problems with concrete cracking. And in the academic world, professors and instructors are using the system to illustrate potential paving problems so that they can be avoided in the future.

Since 2006, the Ohio Department of Transportation has required its contractors to use HIPERPAV II on all concrete pavement projects to evaluate early-age cracking potential. An individual HIPERPAV file must be generated for each scheduled concrete placement to document that early-age cracking will not occur. Each file must include information on strategies chosen by the contractor to address all variables that could influence early-age cracking, including weather conditions, changes in concrete temperature, and construction time.

The Wisconsin Department of Transportation (WisDOT), meanwhile, offers a customized version of the software to potential users statewide. Created by The Transtec Group, Inc., which developed the original HIPERPAV software for FHWA, HIPERPAV-Wisconsin includes unique Wisconsin data inputs and locally used terminology. For example, the customized cement type selection feature allows users to choose from different cement types available at the local manufacturing plants. The customized software is expected to save WisDOT engineers and contractors hours of time in planning,



HIPERPAV II provides assistance in optimizing concrete paving and improving the quality of the final product.

This typical HIPERPAV II analysis screen shows that stress development exceeds the concrete strength.

evaluating complex construction scenarios, and optimally selecting materials and construction factors since the local inputs are already preset in the system.

Contractors are also embracing the software. John Romaine of the Scruggs Company in Hahira, Georgia, has found that HIPERPAV II plays an important role in improving quality, promoting efficiency, and helping control production steps. Romaine uses the software to determine every 4 hours, especially in harsh weather conditions such as very hot or very cold temperatures, he can determine when the optimal saw-cut time windows occur and thereby produce a better quality product that will not crack. He can also better organize his subcontractors, thus preventing wasted time on the job. The end result is money saved and increased profits.

"The beauty of this for a contractor is simple," says Romaine. "It gives peace of mind that your end result will be of quality, and you won't have to rip it out and replace it at your own expense because it cracked when you could have prevented it. I would recommend it to any contractor."

For more information on HIPERPAV II or to download the free software, visit www.hiperpav.com. FHWA also offers a 1-day workshop on using HIPERPAV II. For more information or to schedule the workshop in your State, contact Geoffrey Kurgan at FHWA, 202-366-1335 (email: geoffrey.kurgan@fhwa.dot.gov); Gary Crawford at FHWA, 202-366-1286 (email: gary.crawford@fhwa.dot.gov); or Angel Correa at the FHWA Resource Center, 404-562-3907 (email: angel.correa@fhwa.dot.gov).

Help Desk Offers Pavement Preservation Assistance

After a successful first year launch, funding for the Transportation System Preservation Technical Services Program (TSP²) hosted by the National Center for Pavement Preservation (NCPP) has been extended for a second year. Sponsored by the American Association of State Highway and Transportation Officials (AASHTO), TSP² offers a Help Desk that State transportation departments can call or visit online for information and resources on pavement preservation (see August 2006 *Focus*). The funding extension was approved in September 2007 by the AASHTO Standing Committee on Highways. The extension will also fund the continuation and further development of regional pavement preservation partnership groups. Based on strong user demand, plans are underway as well to reorganize and expand the TSP² Web site (www.tsp2.org) to increase technical content, particularly in the area of bridge preservation, and to improve user accessibility and navigation.

"Utilization of the TSP² Help Desk during the third quarter of 2007 remained brisk, with more than 71,000 Web site hits from State highway agency and local roadway agency practitioners," says NCPP Director Larry Galehouse. The Help Desk has provided assistance and technical support on a range of preservation-related issues, including network evaluation and

asset management techniques, life-cycle cost analysis issues, distress classification guidelines, the use of microsurfacing as a layer over deteriorated concrete, and techniques to retard reflective cracking. Other issues addressed include the use of chip seals to stabilize drainage ditches, volumetrics, quality assurance, slurry seal cure times, and bridge deck restoration using chip seals and epoxy coats.

TSP² offers a Help Desk that State transportation departments can call or visit online for information and resources on pavement preservation.

The TSP² Web site features a System Preservation Technical Library, email listservs where members can post or respond to questions and comments, Bulletin Board System with numerous preservation-related discussion areas, preservation news archive, and event calendar, along with the request system for Help Desk assistance.

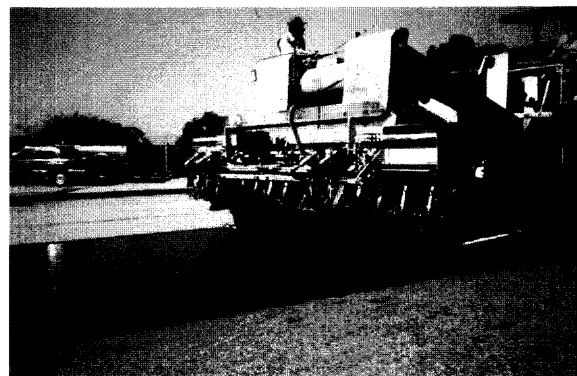
The Help Desk staff can provide personalized professional assistance on any system preservation-related topic, including treatment technologies, asset management, best practices, certification, and network planning strategies.

The Indiana Department of Transportation (INDOT) is a member of the Midwest Pavement Preservation Partnership and has received general guidance from NCPP on pavement preservation, as well as assistance with specifications and training. Training programs have covered chip seals and applied asset management.

"We've received really good feedback on the training," says Todd Shields of INDOT. "Being a member of the regional partnership has also been very useful."

Any AASHTO member can join the TSP². Membership in the program costs \$6,000 per agency per year. Members are assigned a user name and password that allows them to access material on the program Web site. Membership in a regional pavement preservation partnership is an additional contribution of \$3,500 per year. These funds cover the cost of State travel to partnership meetings, as well as meeting organization and facilitation.

For more information on becoming a member of TSP² or joining a regional partnership, contact Steve Varnedoe at the North Carolina Department of Transportation, 919-733-7621 (email: svarnedoe@dot.state.nc.us). To contact the Help Desk, call 517-432-8220 (email: ncpp@egr.msu.edu), or visit www.tsp2.org. The Web site also features information on the regional preservation partnership activities being scheduled at this time. For more information on pavement preservation, contact Joe Gregory at FHWA, 202-366-1557 (email: joseph.gregory@fhwa.dot.gov), or visit www.fhwa.dot.gov/preservation.

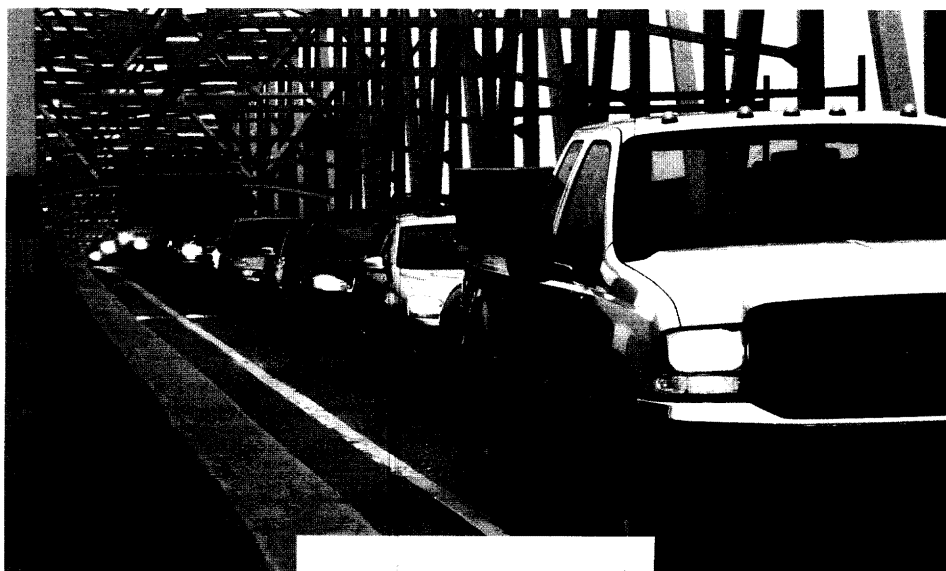


The Help Desk can provide assistance on a range of preservation-related issues, including the use of chip seals.

Better Transportation Planning in Cincinnati through Economic Analysis

For the Ohio-Kentucky-Indiana Regional Council of Governments (OKI), it's full STEAM ahead on using economic analysis tools to better plan transportation improvements. A new case study released by the Federal Highway Administration's (FHWA) Office of Asset Management, *The Ohio-Kentucky-Indiana Council of Governments Experience* (Pub. No. FHWA-IF-07-028), looks at how this metropolitan planning organization (MPO) for greater Cincinnati has adapted FHWA's Surface Transportation Efficiency Analysis Model (STEAM) software to aid in prioritizing and selecting projects. "MPOs select almost all of the Nation's urban transportation projects, and are most directly confronted with the tasks of allocating capital improvement resources to accomplish multiple objectives, including congestion relief and infrastructure replacement and reconstruction," said OKI Executive Director Mark Policinski.

OKI uses a transportation system management (TSM) approach to broaden the range of alternatives considered in addressing transportation needs in the region. Instead of focusing primarily on new construction to solve capacity problems, the TSM approach emphasizes better management and operation of the existing system. Using TSM, OKI monitors the performance of the system, identifies alternative strategies to mitigate congestion, and assesses the effectiveness of implemented actions. To aid in the comparison of alternative strategies, OKI uses a prioritization process, in which scores are given to a range of transportation, planning, and cost factors. Projects are then ranked according to their total scores. While OKI had occasionally used economic analysis in the past for corridor projects, the work had to be performed by outside experts and had been limited to very large projects. With the goal of more



broadly applying economic analysis, especially benefit-cost analysis, and reducing the cost, OKI has recently explored methods for performing such analysis in-house for surface transportation projects. The agency was particularly looking for tools that would be usable by OKI staff, affordable to obtain and operate, and that would make use of existing data resources and staff skills as much as possible. "Other objectives of importance to OKI in selecting a benefit-cost analysis tool were that the model be recognized by Federal and State partners and be able to accommodate transit as well as highway projects," said Christine Matacic, President of the OKI Board of Directors.

OKI's search led it to FHWA's STEAM software. FHWA developed STEAM in the late 1990s to facilitate detailed

OKI uses a transportation system management (TSM) approach to broaden the range of alternatives considered in addressing transportation needs in the region.

Taylor Southgate Bridge connects Cincinnati, OH, and Newport, KY.

corridor and system-wide economic analysis of large transportation projects. STEAM uses trip time, distance, vehicle miles traveled, and other information already generated by travel demand models to compute the net value of mobility and safety benefits attributable to transportation projects.

STEAM accepts input directly from the four-step travel demand modeling process that is used by most MPOs in their planning exercises. It allows users to perform risk analysis and can also produce estimates of system-wide impact.

Starting in 2004, OKI integrated the STEAM software with its travel demand model and then worked with FHWA over the next 2 years to make programming changes to STEAM to accommodate the parameters needed, fix constraints



Fort Washington Way travels through Cincinnati, OH.

encountered, and gain needed technical assistance in updating and interpreting STEAM data. These changes included updating STEAM's economic variables to make them regionally specific for such items as the value of travel time by mode, cost per gallon of fuel, cost per crash, and project capital costs. FHWA also modified the STEAM model to allow users to change the program's default discount rate and to raise the cap on the maximum allowed capital costs of transportation projects.

OKI conducted a trial STEAM evaluation of five projects in 2006. The projects were selected for the trial because their impacts were already well understood based on a completed transportation study. Included were three lane additions, a road extension, and a new interchange. Based on the complementary nature of the projects and OKI's intent to review the projects as a group in the pri-

oritization process, FHWA recommended that the projects be evaluated as a group rather than individually. To facilitate the consolidated project analysis, FHWA developed a new spreadsheet tool known as "STEAMStream." The spreadsheet used the net benefit totals generated by STEAM for discrete analysis years over a 20-year period, interpolated them to intermediate years of the analysis period, and then summed up the benefits and costs to obtain a collective net benefits value. The results showed overall that the group of projects would be cost beneficial, with the findings generally supporting those of the previous transportation study. OKI is now looking at applying STEAM to certain large-scale projects and clusters of related individual projects as part of its planning process. OKI is also investigating the use of a variety of economic analysis tools that can be applied to smaller scale transportation projects.

"The successful trial of the STEAM model, as well as the research into economic analysis that OKI undertook to select and provide data to STEAM, has significantly advanced OKI's agenda of incorporating more economic analysis into our transportation planning process," said Maticic.

OKI's experience has also given FHWA important feedback on the STEAM model. FHWA is now developing an improved guidance document for STEAM that will benefit all users of the model. The new guidance will more thoroughly address which types of projects are appropriate for analysis by STEAM, how to develop the appropriate STEAM inputs from the travel demand model for the selected projects, and how to determine if the travel demand model analysis constitutes valid input into the STEAM model. Use of the STEAMStream spreadsheet will also be covered.

The FHWA case study is available online at www.fhwa.dot.gov/infrastructure/asstmgmt/wsoki0700.cfm. To learn more about OKI's use of the STEAM model, contact OKI Senior Planner Mary Luebbers, 513-621-6300, ext. 196 (email: mluebbers@oki.org). For more information on STEAM or to obtain a copy of the model, contact Eric Gabler, 202-366-4036 (email: eric.gabler@dot.gov), or Francine Shaw-Whitson, 202-366-8028 (email: francine.shaw-whitson@fhwa.dot.gov). Information is also available online at www.fhwa.dot.gov/steam. The STEAM Web site features a "Frequently Asked Questions" forum and "Ask the Expert" section, as well as the opportunity to register for the STEAM User's Group.

Highway Technology Calendar

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

Seventh National Conference on Transportation Asset Management

November 6-8, 2007, New Orleans, LA

Three thematic tracks will be featured at the conference: Integration of Maintenance and Operations into Transportation Asset Management, Putting Economics into Practice, and Transportation Asset Management in the Ports and Harbors Community. The conference is sponsored by the Transportation Research Board's (TRB) Committees on Transportation Asset Management and Transportation Economics, with support from the Federal Highway Administration's (FHWA) Office of Asset Management.

Contact: David Floyd at TRB, 202-334-2966 (email: dfloyd@nas.edu), or Francine Shaw-Whitson at FHWA, 202-366-8028 (email: francine.shaw-whitson@fhwa.dot.gov).

International Conference on Optimizing Paving Concrete Mixtures and Accelerated Concrete Pavement Construction and Rehabilitation

November 7-9, 2007, Atlanta, GA

The conference will provide an international forum to address various aspects of concrete mixture optimization and accelerated concrete pavement construction and rehabilitation that result in long life for pavements. The event is being organized as part of the technology transfer activities for FHWA's Concrete Pavement Technology Program.

Contact: Shiraz Tayabji at CTLGroup, 410-997-0400 (fax: 410-997-8480; email: stayabji@CTLGroup.com), or Sam Tyson at FHWA, 202-366-1326

(email: sam.tyson@fhwa.dot.gov).

Information and online registration are available at www.fhwa.dot.gov/pavement/concrete/2007CPTPconf.cfm.

Highway Quality Conference

November 13-14, 2007, San Diego, CA

Sponsored by the National Partnership for Highway Quality (NPHQ), the conference will share information about advanced tools and techniques, best practices, and innovations in highway quality.

Contact: Bob Templeton at NPHQ, 512-301-9899 (email: btemplenphq@aol.com), or Ken Jacoby at FHWA, 202-366-6503 (email: ken.jacoby@fhwa.dot.gov). Information is also available at www.nphq.org.

World Steel Bridge Symposium 2007

December 4-7, 2007, New Orleans, LA

The symposium will bring together design engineers, construction professionals, transportation officials, representatives from academia, and others to discuss state-of-the-art practices for enhancing steel bridge design, fabrication, and construction techniques. This event is sponsored by the National Steel Bridge Alliance and FHWA.

Contact: Elizabeth Purdy at the American Institute of Steel Construction, Inc., 312-670-5421 (email: purdy@aisc.org), or Vasant Mistry at FHWA, 202-366-4599 (email: vasant.mistry@fhwa.dot.gov). For additional information, visit

www.steelbridges.org (click on "World Steel Bridge Symposium").

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

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 FHWA and 13 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.

Seeking the Best Solutions with Highways for LIFE

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.

“Seeking the Best Solutions” is the goal of a new workshop available from the Federal Highway Administration’s (FHWA) Highways for LIFE (HfL) program. The workshop is designed to give States the tools to develop a process for setting customer-focused performance goals and incorporating innovations into highway projects.

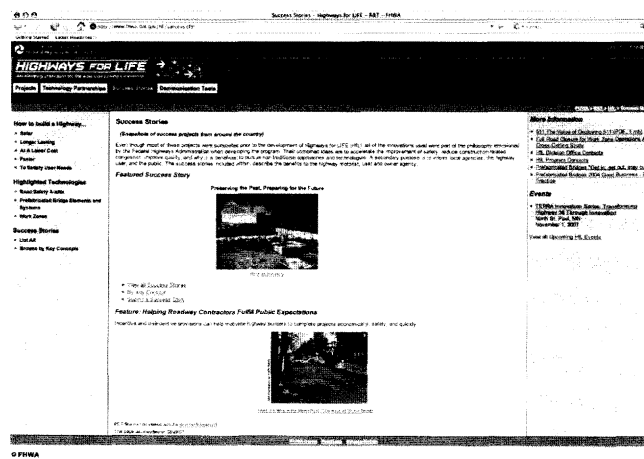
The new HfL workshop is modeled after FHWA’s Accelerated Construction Technology Transfer (ACTT) workshop, in which participants identify strategies for saving time and money on highway projects, while increasing quality and safety. The HfL workshop can be presented on its own or can serve as a precursor to an ACTT workshop or FHWA’s Performance Contracting Framework workshop.

“The HfL workshop is designed to support the program’s mission to improve the American driving experience,” says Mary Huie of FHWA. Sessions can focus on general, program-level project delivery or specific projects, including those for which a State is considering seeking HfL funding. The workshop can be tailored to one State’s needs or include participants from several States in a region.

At a typical workshop, participants will be given the opportunity to identify and evaluate innovations that enhance quality and safety and reduce construction congestion to determine the best solutions for projects. They will also discuss why and how to use performance contracting and other innovative contracting techniques. “The primary goal of the workshop is to explore setting measurable, customer-focused project goals that inspire and motivate the highway agency to use innovations that benefit taxpayers and motorists,” says Huie.

Workshop participants will typically include representatives from State agencies involved in project planning and construction and FHWA division offices. The workshop can be scheduled as 2 half-day sessions or 1 full day. There is no cost for the workshop. The host State is only asked to provide the facility.

For more information on scheduling the “Seeking the Best Solutions” workshop, contact Mary Huie at FHWA, 202-366-3039 (email: mary.huie@fhwa.dot.gov). Additional information on HfL is available online at www.fhwa.dot.gov/hfl.



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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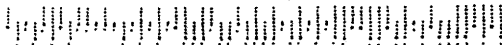
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Seventh International Conference on Managing Pavement Assets: Investing in the Future

The latest innovations in asset management will be on display at the Seventh International Conference on Managing Pavement Assets (ICMPA), to be held in Calgary, Canada, from June 24–28, 2008. Building on the success of the last conference held in Brisbane, Australia, in 2004, the 2008 ICMPA will offer transportation agencies from the United States, Canada, and a host of other countries the opportunity to learn about pavement management practices from around the world. "As State highway agencies move ahead in implementing asset management, pavement management is an important part of that effort," says Steve Gaj of FHWA's Office of Asset Management. "With the conference being held in North America, it's a particularly good opportunity for States to attend."

the Future, and Finding the Balance," notes Roy Jurgens of Alberta Infrastructure and Transportation in Alberta, Canada. The conference will feature a larger and more diverse program, with additional presentations and networking sessions, as well as an expanded trade show. Topics will include asset preservation and maintenance, asset management tools, cost-effectiveness methodologies, performance-based planning, data collection and management, performance measurement, and stakeholder involvement. Numerous technical tours are also planned, including one focusing on mountain highway engineering in the Rocky Mountain Parks and a visit to the City of Calgary Traffic Management Center.

For more information on the conference, send an email to ICMPA2008@ntplan.net or visit www.icmpa2008.com.



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