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Pavement Preservation Forum II: Investing in the Future

or the nearly 200 participants of the National Pavement Preservation Forum II, held in San Diego, California, in November 2001, the numbers told the story. The Michigan Department of Transportation (DOT) estimates that it has saved more than \$700 million since implementing a pavement preventive maintenance program in 1992. In California, the number of lane miles in need of repair on the Nation's most heavily traveled highway system is at its lowest level in 10 years, thanks to an infusion of pavement preservation funds. And in a recent survey, 34 of the 40 highway agencies that responded reported that they have established preventive maintenance programs.

These examples and many more were highlighted in the 3-day conference, which gave participants an opportunity to share success stories, detail challenges, and discuss what comes next. "Many of the issues and challenges we face are the same," said conference cochair Larry Orcutt of the California DOT. He urged conference attendees to ask themselves, "What can I take back to my area of the country? What can I do to make a difference?"

The event, which was a follow-up to the 1998 Forum for the Future, was sponsored by the Foundation for Pavement Preservation (FPP), Federal Highway Administration (FHWA), and the California DOT.

From California to Georgia, pavement preservation is ultimately about "keeping good roads good." It involves the timely application of carefully selected treatments to maintain or extend a pavement's service life. These treatments may include various types of surface seals, thin lift overlays, and crack sealing

for asphalt pavements. Treatments for concrete pavements might include crack and joint sealing, diamond grinding, and retrofit dowel bars. The key is to apply the treatments when the pavement is still in good condition, with no structural damage. Placing a treatment too late will result in poor performance, while applying treatments too early can cause other pavement problems and use up funds before they are needed. As keynote speaker Tommy Beatty of FHWA noted, "We must apply the right treatment to the right road at the right time to get the most out of our maintenance dollars."

A primary theme of the conference was the importance of education and awareness as vehicles for promoting pavement preservation. Other keys to success cited by forum participants were:

- Adequate dedicated funds
- Effective marketing of preventive maintenance
- Support from management
- Legislative support
- Training and buy-in of workers
- Public awareness of the financial benefits of preventive maintenance.

California is directing more than \$50 million to preventive maintenance. "The competition for transportation funds is fierce. We had to demonstrate the benefit of making the investment in preventive maintenance in terms of safety, improved ride ability, and longer lasting pavements requiring fewer and less fre-

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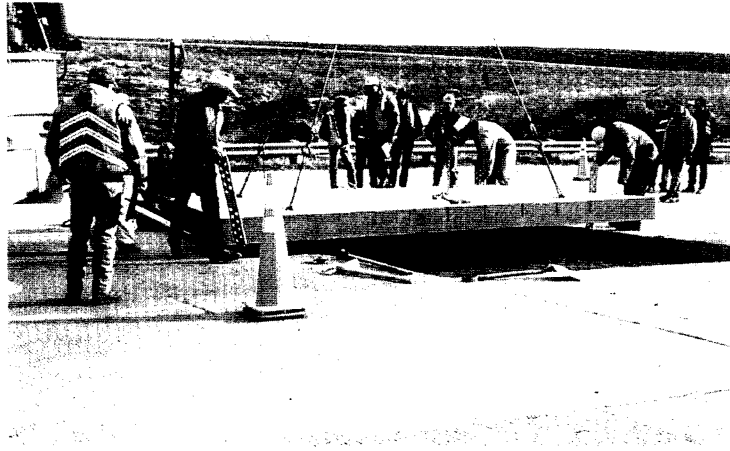
Pavement Preservation Forum II,

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quent repairs," said Susan Massey, California DOT's Pavement Program Manager. "We had to tell them it's good business, that it's a good investment." The DOT began its pavement preservation efforts in 1992 and now issues an annual Pavement Condition Report, which it uses to determine high-priority needs. The DOT also developed 10-year pavement goals, which were implemented in 1998. These goals include reducing the backlog of distressed lane kilometers from 22,000 (14,000 mi) to 8,000 (5,000 mi) by 2008.

Preventive maintenance work to date has included applying a 30-mm (1.2-in) asphalt rubber overlay to 241 lane km (150 lane mi) of Interstate 5 in Fresno. The work, which was done by Granite Construction Company, had to be completed in 65 days and come with a 1-year warranty. "We knew it was going to take some additional quality controls to do the project," said Jim Queener of Granite. These measures included performing multiple trial mixes in the lab before work started. Granite also conducted frequent quality control tests while the job was underway. Ultimately, "this was a really successful job," said Queener. The DOT, said Orcutt, found that the overlay "improved the ride dramatically and extended the pavement life by 10 additional years."

Colorado DOT is looking at both improving its pavements and working faster and more efficiently by taking an innovative approach and performing full depth restoration with precast concrete panels. An initial test and evaluation project was conducted on US 287 near Fort Collins, Colorado, in December 2000. Using new technology developed by URETEK USA, three panels, approximately 3.6-m (12-ft) x 4.6-m (15-ft) each, were removed and replaced with custom sized and shaped precast concrete slabs. The site was reopened to traffic the same day. A project was then conducted on I-25 in June 2001 that involved replacing eight 3.6-m (12-ft) x 4.9-m (16-ft) panels in an overnight operation.



Full depth restoration is performed on US 287 near Fort Collins, Colorado, using precast concrete panels.

The site was reopened to traffic by 5:30 a.m. the next day. Colorado is now looking at replacing 44 panels on both I-25 and US 287 this spring using the precast method.

The conference also provided the contractor's view. "Being a preventive maintenance contractor has changed dramatically in the past 25 years," said Michael Buckingham of Strauser, Inc. "Training is an important aspect of preventive maintenance for both the agency and the contractors. As contractors we need to know what the most effective time is to apply preventive maintenance treatments."

Training is also important for the next generation of engineers. A session on education and outreach highlighted the work the University of Illinois is doing, in conjunction with the FPP, to develop a Pavement Preservation curriculum that can be adapted and used by other universities. The material will include lecture outlines, an instructor's guide, and visual aids.

As conference organizers and participants looked at the future of pavement preservation, they noted that challenges exist, particularly as top management priorities change. "As long as you can demonstrate on a daily basis the importance of performing preventive maintenance, you will continue to enjoy public support and the resources to get the job done," Orcutt said. Documenting the benefits of preventive maintenance can help maintain that support, he noted. Data must be accurate and it should also be accessible. Surmounting the challenges and carrying forward with the progress made to date, added conference cochair Jim Sorenson of FHWA, will also require partnerships that share a common vision, increased worker training, additional research into new and improved

techniques, and better communication with stakeholders and the public.

For more information on pavement preservation treatments and techniques, contact Julie Trunk of the FHWA Office of Asset Management's Construction and System Preservation Team, 202-366-1557 (fax: 202-366-9981; email: julie.trunk@fhwa.dot.gov; Web: www.fhwa.dot.gov/infrastructure/asmtgmt/preserv.htm), or Steve Hersey at FPP, 703-610-9036 (fax: 703-610-9005; email: info@fp2.org; Web: fp2.org).

Providing Early Protection for Pavements

"Providing Early Protection" is the theme of a workshop on sealers and binders scheduled for March 1, 2002, in Myrtle Beach, South Carolina. The workshop will explore the history and use of emulsified sealers and binders, as well as current research in this area. Featured topics include evaluating the effectiveness of sealers and binders and calibrating equipment properly. FHWA and FPP are sponsoring the workshop, which is being hosted by the South Carolina Department of Transportation. For more information, contact Julie Trunk at FHWA, 202-366-1557 (fax: 202-366-9981; email: julie.trunk@fhwa.dot.gov), or Steve Hersey at FPP, 703-610-9036 (fax: 703-610-9005; email: info@fp2.org; Web: fp2.org).

A New and Improved High-Performance Concrete

Over, high-performance concrete (HPC). The next generation of HPC, known as ultra-high-performance concrete (UHPC), is currently being evaluated at the Federal Highway Administration's (FHWA) Turner-Fairbank Highway Research Center in McLean, Virginia. The Center's Structures Laboratory is testing two American Association of State Highway and Transportation Officials (AASHTO) Type II prestressed concrete girders fabricated from UHPC. The tests are intended to characterize the girder's structural behavior and determine how well the current AASHTO design provisions represent that behavior.

UHPC is a steel fiber-reinforced reactive powder concrete that typically displays twice the compressive strength of any HPC used in United States bridge construction to date. The French firm Bouygues SA developed the reactive powder concrete, which is engineered to be a highly compacted concrete with a small, disconnected pore structure that helps to minimize many of the limitations of typical HPC. These advancements are achieved through a combination of finely ground powders and the elimination of coarse aggregates.

The addition of small steel fibers to the mix is responsible for much of the tensile strength and toughness of the material. These fibers eliminate the need for mild reinforcing steel in the girders.

FHWA's testing of UHPC has revealed it to be a promising material for use in the bridge construction industry. FHWA plans to conduct additional tests that will fully characterize the material.

The placement and curing of UHPC can be performed using procedures similar to those already established for use with some HPCs. The fluid mix is virtually self-placing and requires no internal vibration. If required, external form vibration causes the mix to smoothly flow into place. Following an initial set of 24 hours, the curing process requires at least an additional 48 hours, including a vapor bath at a constant 88 °C (190 °F).

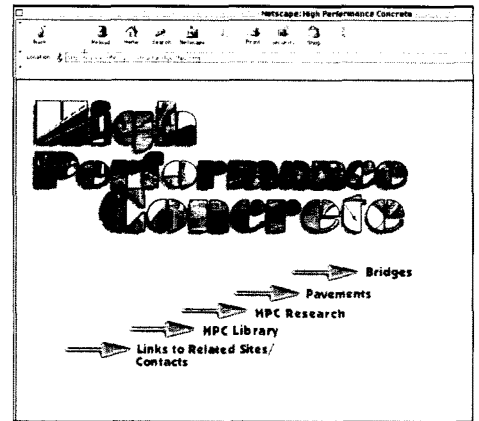
The structural test of the first girder delivered some impressive results. Just prior to failure, the 24-m (80-ft) long girder displayed a mid-span deflection of more than 485 mm (19 in). Even more impressive was the girder's ability to sustain a large load and associated deflection without creep, relaxation, or any visual sign of distress. For example, the flexural test was

suspended for more than 12 hours with 300 mm (12 in) of mid-span deflection locked into the girder. During that time, the girder was unchanged, and even with the aid of a 3x magnifying glass there were no detectable cracks.

To date, three additional structural tests designed to determine the shear capacity of the UHPC girders have been completed. These tests revealed that the shear capacity of a UHPC girder without shear reinforcement is approximately two to three times

that of a conventionally reinforced prestressed concrete girder.

FHWA's testing of UHPC has revealed it to be a promising addition to the HPC



Learn more about FHWA's high-performance concrete research at www.fhwa.gov/structure/hpc/hpc.htm

currently being used by the bridge construction industry. FHWA plans to conduct additional tests that will fully characterize the material, and once the behavior of UHPC is understood, its use in bridge construction will be further investigated. Joey Hartmann of FHWA says, "UHPC is a very promising material that will have multiple applications, but there will need to be further application development to make it efficient."

Numerous other countries are already employing UHPC. Canada and South Korea have used UHPC for pedestrian bridges, Portugal has employed it for sea-wall anchors, Australia has committed to its use in a vehicular bridge, and France has used it in building power plants. In all of these cases, the material was chosen for its ability to stand up to high stress, both environmental and load related. The increasing deployment of UHPC worldwide and FHWA's initial testing results for the product bode well for its future use.

For more information on UHPC, contact Joey Hartmann at FHWA, 202-493 3059 (fax: 202-493-3442; email: joey.hartmann@fhwa.dot.gov).

Welcome to the World of Nondestructive Testing

ooking to learn more about non-destructive and innovative testing (ND&IT) for concrete? A new workshop developed by the Federal Highway Administration (FHWA) provides a comprehensive review of the latest ND&IT for concrete in highway applications. The workshop places particular emphasis on in-place measurement of early-age properties of concrete.

A pilot workshop will be hosted by the Maryland State Highway Administration on April 9–11, 2002, with additional workshops to follow across the country. The workshop will cover:

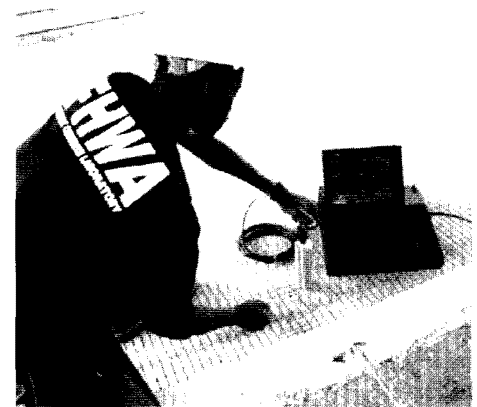
- Theory and background for ND&IT technologies
- Advantages and disadvantages of ND&IT equipment
- Hands-on testing with the equipment
- Typical specifications and Quality Control/Quality Assurance (QC/QA) testing plans using nondestructive testing techniques.

Participants will have the opportunity to gain hands-on experience with some of the testing equipment covered, such as the Concrete Thickness Gauge and equipment for measuring pulse velocity, maturity, and tensile bond strength. The workshop will also include demonstrations of other testing equipment, such as the Air Void Analyzer and technology for performing the impact-echo test and spectral analysis of surface waves.

Nondestructive testing has the advantages of measuring in-place properties of the concrete and providing rapid results, while causing minimal damage to the concrete. NDT is also cost-effective and permits more testing to be done than if conventional methods were used. These

testing techniques are becoming increasingly important as the pavement industry moves toward using performance-related specifications, warranties, high-performance concrete, and extended life pavements.

For more information on the workshop, contact Gary Crawford at FHWA, 202-366-1286 (fax: 202-493-2070; email: gary.crawford@fhwa.dot.gov).



This picture shows the impact-echo test being performed. The core sample (left) was taken from a distressed pavement.



This Maturity Meter is measuring the pavement's compressive and flexural strength.



Shown here is the Air Void Analyzer.

Fulfilling the LTPP Promise

hirteen years ago, the Long-Term Pavement Performance (LTPP) initiative was launched with the goal of achieving longer-lasting, better performing pavements. *Fulfilling the Promise of Better Roads*, a new report by the Transportation Research Board's (TRB) LTPP Committee, examines what the program has accomplished so far and what remains to be done. The report also examines the level of funding needed to successfully conduct the LTPP program from 2004 to 2009.

The LTPP program's three main activities are data collection, data analysis, and product development. Data collected from eight General Pavement Studies (GPS) and nine Specific Pavement Studies (SPS) experiments are stored in the LTPP database. This 13-gigabyte database is the most comprehensive source of pavement performance data ever assembled. The combined studies currently encompass about 2,100 in-service test sections, with such collection categories as climate, traffic volumes and loads, materials properties, and pavement condition.

LTPP data analysis projects have resulted in the development of a number of products for the highway community, including the LTPPBind software, which allows engineers to more accurately select the correct Superpave asphalt binder for their specific environmental conditions; the 1998 Supplement to the American Association of State Highway and Transportation Officials (AASHTO) Design Guide and the associated Rigid Pavement Design Software; and the DataPave software, which offers commonly requested data in an easy-to-use CD format.

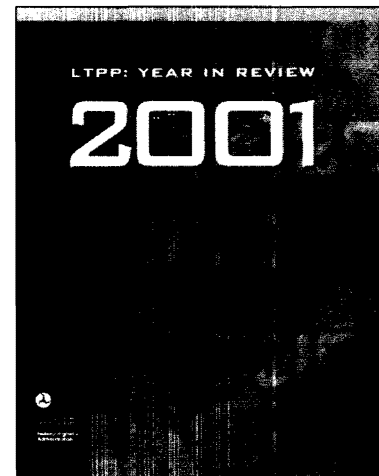
The LTPP program now stands at a crossroads. The Transportation Equity Act for the 21st Century (TEA-21) expires in September 2003, and the next

You can learn more about the LTPP program's recent work by checking out the new report, *LTPP: Year in Review 2001* (Publication No. FHWA-RD-02-049). The report outlines the program's accomplishments last year and provides an overview of key initiatives for 2002. The accomplishments for 2001 included supporting the development of the National Cooperative Highway Research Program's *2002 Guide for the Design of New and Rehabilitated Pavement Structures* and releasing the updated DataPave 3.0 software, which provides easy access to LTPP data. 2002 initiatives will include finalizing a study of pavement edge drains at Specific Pavement Study (SPS) -1, -2, and -6 sites and continuing a pooled fund study to improve traffic data collection at the SPS -1, -2, -5, -6, and -8 projects.

To obtain a copy of the report, contact Mary Taylor-Mattox at FHWA, mary.taylor-mattox@fhwa.dot.gov.

Reauthorization period will be crucial to the accomplishment of the LTPP program's goals. As the report notes, much has been accomplished, but several potentially significant gaps must be closed before data collection is completed. These gaps include: 1) traffic volume and load data collection at the SPS sites, 2) selected materials testing on certain SPS projects, and 3) completion of performance monitoring data collection on a schedule that identifies the onset of distress at each test section.

The report also recommends an assessment of the LTPP program be conducted in 2006 to determine whether data collection may be concluded by 2009 or will have to continue beyond that date to capture performance data from SPS test sections that were built in the late 1990s. This is an important decision since, as the report states, "All data components in the data collection plan appear there because they can contribute to our understanding of the relationship among environment, pavement 'loading,' and performance. Any portion of the performance data that is missing is a gap in the database that could prevent complete development of this understanding."



In the end, achieving the LTPP program's goals will also depend upon funding. TEA-21 provided less money to the LTPP program than did its legislative precursor, the Intermodal Surface Transportation Efficiency Act. AASHTO and the National Cooperative Highway Research Program addressed a portion of the shortfall by infusing about \$4.4 million per year into the program in 1999, 2000, and 2001, but this infusion comes at the expense of not funding other research projects. "To execute its plans for data collection, data analysis, and product development," notes the report, "LTPP needs to receive sufficient funding from 2004 to 2009."

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In Brief...

The report's recommendations include giving the highest priority to closing the data gaps and implementing the enhanced data collection schedule between 2004 and 2009. The report also recommends that plans be developed to "secure the legacy" of the LTPP program. These plans should cover such activities as storing and maintaining the LTPP database and Materials Reference Library and continuing implementation of LTPP data analysis and product development beyond the conclusion of the program.

For more information on the report or to obtain a copy, contact Cynthia Baker at TRB, cbaker@nas.edu. For more information on the LTPP program, contact Aramis Lopez at FHWA, 202-493-3145 (email: aramis.lopez@fhwa.dot.gov). Information can also be found on the LTPP Web site at www.tfhr.gov/pavement/ltppltp.htm or by sending an email to ltpinfo@fhwa.dot.gov.

Learn more about the **narrow-gap improved electroslag welding process for steel bridges** at a Federal Highway Administration (FHWA) demonstration project (DP-102) scheduled for March 12-14, 2002, in Montgomery, Alabama. This new process is a variance of the conventional electroslag welding process used to join thick steel plates for bridges in a vertical position. The new high-speed process improves the reliability of the weld and can increase productivity. The demonstration project is designed for highway agency bridge engineers, welding engineers, welding inspectors, steel bridge fabricators, consultants, and others. Demonstration topics include welding equipment and requirements, setup and operation, and operator controls and adjustments. For more information, contact Robert L. King at FHWA, 334-223-7376 (fax: 334-223-7325; email: robert.king@fhwa.dot.gov), or Randall Mullins at the Alabama Department of Transportation (DOT), 334-242-6015 (fax: 334-353-6502; email: mullinsr@dot.state.al.us). Information is also available on the Web at www.fhwa.dot.gov/bridge/alabama.htm.

Mark your calendar now for the **Seventh Annual Eastern Winter Road Maintenance Symposium and Equipment Expo**, scheduled for September 4-5, 2002, in Charleston, West Virginia. Born out of the "Blizzard of '96," during which transportation in Eastern States nearly ground to a halt, the event provides a forum for the exchange of information and technologies. Last year's symposium drew 1,650 people to Worcester, Massachusetts. The symposium is intended for winter maintenance managers and other public works practitioners, as well as their private sector partners, from cities, townships, counties, States, and Federal agencies east of the Mississippi River. Symposium topics include the state-of-the-practice in anti-icing; new products, equipment, and other tools; and how to plan for and direct all aspects of storm management.

For more information, contact Deborah Vocke at FHWA, 410-962-3744 (fax: 401-962-3419; email: deborah.vocke@fhwa.dot.gov). You can also visit the symposium Web site at www.easternsnowexpo.org/main.htm. For more information on winter maintenance technologies, contact Paul Pisano at FHWA, 202-366-1301 (fax: 202-366-3225; email: paul.pisano@fhwa.dot.gov).

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The Eastern Winter Road Maintenance Symposium will feature the latest in equipment and technologies. Shown here is the exhibit hall of the 1999 Symposium, held in Albany, New York.

Highway Technology Calendar

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

Sealer/Binder Workshop: Providing Early Protection March 1, 2002, Myrtle Beach, SC

The workshop will look at the effectiveness of sealers, rejuvenators, and binders for preserving a pavement's service life. The Federal Highway Administration (FHWA) and the Foundation for Pavement Preservation (FPP) are sponsoring the workshop, which is being hosted by the South Carolina Department of Transportation (DOT).

Contact: Julie Trunk at FHWA, 202-366-1557 (fax: 202-366-9981; email: julie.trunk@fhwa.dot.gov), or Steve Hersey at FPP, 703-610-9036 (fax: 703-610-9005; email: info@fp2.org).

SMA in the USA Workshop March 25-27, 2002, Frederick, MD

This workshop will provide the latest technical and performance updates on Stone Matrix Asphalt (SMA) pavements in the United States. The workshop is sponsored by FHWA, Maryland State Highway Administration (SHA), Virginia DOT, Asphalt Pavement Alliance, International Society for Asphalt Pavements, and State asphalt pavement associations.

Contact: John Bukowski at FHWA, 202-366-1287 (email: john.bukowski@fhwa.dot.gov) or Gloria Burke at Maryland SHA, 800-477-7453 (email: gburke@sha.state.md.us).

Third International Symposium on 3D Finite Element for Pavement Analysis, Design, & Research April 2-5, 2002, Amsterdam, The Netherlands

The symposium will highlight new worldwide developments in the use of the 3D finite element method for investigating pavement structural problems.

Contact: Samir N. Shoukry at West Virginia University, 304-293-3111, ext. 2367 (fax: 304-293-6689; email: samir.shoukry@mail.wvu.edu; Web: www.3dfem.org).

International Center for Aggregates Research (ICAR) 10th Annual Symposium April 14-17, 2002, Baltimore, MD

The symposium will feature discussion on asphalt concrete, bases, and fines. The event is being cosponsored by the Aggregates Foundation for Technology, Research, and Education and the National Stone, Sand, and Gravel Association.

Contact: ICAR at 512-471-4498 (email: icar@mail.ce.utexas.edu; Web: www.ce.utexas.edu/org/icar).

Third National Seismic Conference and Workshop on Bridges and Highways

April 28-May 1, 2002, Portland, OR

The conference will feature the latest research and developments in seismic engineering for bridges, highway systems, and components. The event is being sponsored by the Oregon DOT, Washington State DOT, and FHWA.

Contact: For registration information, contact Michael Higgins at Pure Technologies, 410-309-7050 (fax: 410-309-7051; email: mike.higgins@soundprint.com). For information on conference content, contact Roland Nimis at FHWA, 415-744-2653 (fax: 415-744-2620; email: roland.nimis@fhwa.dot.gov).

Nineteenth Annual International Bridge Conference

June 10-12, 2002, Pittsburgh, PA

Current products, methods, and applications in the bridge industry will be discussed at the conference.

Contact: Engineers Society of Western Pennsylvania, 412-261-0710 (fax: 412-261-1606; email: conf@eswp.com).

First International Conference on Bridge Maintenance, Safety, and Management

July 14-17, 2002, Barcelona, Spain

Conference topics will include bridge management systems, high-performance materials, nondestructive testing, and composites. Sponsors of the event include the International Association for Bridge and Structural Engineering, University of Colorado at Boulder, Transportation Research Board, and FHWA.

Contact: International Center for Numerical Methods in Engineering, iabmas02@cimne.upc.es (Web: www.cimne.upc.es/congress/iabmas02).

Ninth International Conference on Asphalt Pavements

August 17-22, 2002,
Copenhagen, Denmark

The conference will address the design, construction, maintenance, and performance of asphalt pavements.

Contact: DIS Congress Service Copenhagen A/S at isap2002@discongress.com (Web: www.asphalt.org/calendar/copenhagen2.html).

Seventh Annual Eastern Winter Road Maintenance Symposium and Equipment Expo

September 4-5, 2002, Charleston, WV

Symposium topics include the state-of-the-practice in anti-icing and new products and equipment for winter maintenance.

Contact: Deborah Vocke at FHWA, 410-962-3744 (fax: 401-962-3419; email: deborah.vocke@fhwa.dot.gov).

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FHWA Announces New Source of Bridge Preservation Funding

Maintenance and preservation of highway bridges received a boost in January 2002, when the Federal Highway Administration (FHWA) announced that Highway Bridge Replacement and Rehabilitation Program (HBRRP) funds can be used to perform preventive maintenance on highway bridges. This new flexibility in State highway agencies' use of the Federal funds will help extend the useful life of bridges in a cost-effective manner. The added flexibility will also assist States in using their limited highway budgets to best manage their aging highway assets.

Preventive maintenance activities eligible for funding include sealing or replacing leaking joints; applying deck overlays that will significantly increase the service life of the deck by sealing the deck surface and reducing the impact of aging and weathering; painting the structural steel; and applying electrochemical chloride extraction treatments to decks and sub-

structure elements. States are encouraged to contact their local FHWA division offices for more specific details on eligible work.

King Gee, Program Manager for FHWA's Office of Infrastructure, noted in his announcement of the new policy that, "It is important that system preservation activities for the purpose of preventive maintenance on bridges be carried out using a systematic process, such as a Bridge Management System (BMS)." A BMS can help a State make the most efficient use of preventive maintenance funding by creating cost/benefit scenarios and investment strategies.

For more information on using HBRRP funds for bridge preservation activities, contact your local FHWA division office or Ray McCormick at FHWA, 202-366-4675 (email: raymond.mccormick@fhwa.dot.gov). For more information on implementing a BMS, contact George Romack at FHWA, 202-366-4606 (email: george.romack@fhwa.dot.gov).

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www.tfhrc.gov/focus/focus.htm

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