



INFRASTRUCTURE

FHWA Develops New Method of Testing Concrete

In their search for better highways, researchers at FHWA have developed a precise method for determining the rate at which portland cement concrete (PCC) contracts and expands during temperature changes. The information generated by this new method will lead to longer lasting, smoother roads.

About half of the roads on the 69,000-kilometer (43,000-mile) Interstate system are composed of concrete or a combination of asphalt and concrete. The new test method provides a means of characterizing concrete that will significantly improve the pavement design process by better matching pavement to its environment.

"This kind of application-oriented research is part of our commitment to providing Americans with the safest, most efficient transportation system in the world," said Kenneth R. Wykle, FHWA Administrator. "Our new testing procedure will take the guesswork out of one of the most critical elements of PCC pavement design, enabling engineers to fine-tune the process at the outset to significantly improve roads."

The thermal coefficient of expansion (T-coeff), the rate at which

concrete contracts and expands as temperature changes, is a critical factor in pavement design. The new method determines the T-coeff by precisely measuring the change in length of a sample of the concrete when it is heated and cooled. The capability for testing the T-coeff has been around for some time, but this new procedure makes it easier to collect the data, requires little additional equipment, and most importantly, standardizes the process.

Before FHWA's new testing proce-

dures, pavement designers usually relied on an average value to estimate the T-coeff of PCC. Using an average value left the design process vulnerable to incorrect assumptions about a specific pavement's response to temperature changes. This increased the potential for producing pavements that would develop bumps, cracks, and other surface irregularities after construction.

The new test method, which includes new testing equipment, *(Continued on page 3)*



Researchers in the lab at TFHRC demonstrate new methods for testing PCC that can better detect the possibilities of freeze/thaw damage.

The *Research and Technology Transporter* communicates FHWA research, development, and technology accomplishments, findings, information, and technology transfer opportunities. Its audience is transportation engineers and professionals in State and local highway agencies, State DOTs, Local Technical Assistance Programs, Divisions, Resource Centers, Core Business Units, academia, and the research community. The eight-page newsletter is published monthly by FHWA's RD&T service business unit. Editorial offices are housed at the Turner-Fairbank Highway Research Center. Comments should be sent to the editor at the address below. Field offices are encouraged to submit articles for publication via the appropriate agency technology leader from the editorial board listed below. The newsletter can be viewed online at www.tfhrc.gov. Subscriptions to the *Transporter* are free. Send your request to Judy Dakin at the address below, or send email to judy.dakin@fhwa.dot.gov.

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After All These Years, FHWA Bridge Engineers Meet

For the first time in the past 20 years, FHWA bridge engineers got together in Arlington and McLean, Virginia. Seventy-five bridge engineers representing 47 States and territories, Resource Centers, Federal Lands, the Office of Bridge Technology, and TFHRC turned out for the 4-day meeting that was organized by Ray McCormick, Acting Director of the Office of Bridge Technology. The theme for the meeting was "Focus on the Future."

Office of Infrastructure Program Manager Vince Schimmoller welcomed the group and provided insight into the interests and future needs of the agency's infrastructure technology. The meeting focused on technologies such as high-performance structural materials to extend the service life of existing bridges and to increase the service life of new or replacement construction. First-day presentations focused on the advancement of a strategy for innovation and technology by Roy Trent and the topic of Load and Resistance Factor Design (LRFD). Dennis Mertz, Professor of Civil Engineering at the University of Delaware, provided an outstanding overview of LRFD, the design method that FHWA is promoting for adoption by all State highway departments. Several FHWA bridge engineers from around the country discussed LRFD design examples for bridge girders, decks, and foundations. Retired FHWA bridge engineer John Ahlskog led the discussion on deck design concerns. Western Resource Center bridge engineer

Roland Nimis led a panel discussion with Ben Tang, Doug Edwards, Barry Brecto, and Gary Jakovich on challenges faced by FHWA bridge engineers in the next 5 to 10 years.

Activities on the second day were held at TFHRC, where Paul Teng, Director of Infrastructure R&D, welcomed the group and offered the assistance of TFHRC bridge and structures staff to work with the Divisions, Resource Centers, Federal Lands, and Headquarters bridge engineers in meeting the challenges of achieving the agency's mission and strategic goals. Several of TFHRC's bridge engineers discussed the practical aspects of high-performance materials, best painting and anti-corrosion practices for steel and concrete bridges, bridge management systems, bridge inspection, use of National Bridge Inspection data, bridge railing and transition performance, foundation databases used to help designers, and Hydraulics Laboratory technical support activities. The day was concluded with short tours of the TFHRC Structures and Hydraulics laboratories and the prototype HERMES bridge deck inspection system that is being funded through a pooled-fund study to advance the radar-based inspection system into practice.

Activities on the third day focused on diverse topics such as VIRTUS/OPIS bridge rating, analysis and design tools, historic bridges and their sensitivities with various interest groups, numerous

(Continued on page 3)



Bridge engineers from nearly all divisions, resource centers, and headquarters met for the first time in 20 years. During the meeting, engineers got a glimpse of some of the services and facilities available at TFHRC.

(Continued from page 2)
environmental issues faced in bridge construction and rehabilitation, Buy America impacts on the bridge industry, innovative contracting and financing for the Nation's bridges, the congressionally directed Innovative Bridge Research and Construction Program, and the relationship of intelligent transportation systems (ITS) technologies with "smart" bridges of the future. Several highly technical topics related to larger bridges, such as prestressed concrete segmental construction and cable-stayed bridge design and construction, were discussed. The roles that Federal Lands plays with other agencies in the highway bridge design area were presented.

FHWA's geotechnical and hydraulics engineers discussed issues in the context of overall bridge performance.

The last day saw several interesting and provocative panel discussions that focused on high-performance materials, lessons learned, best practices in the National Bridge Inspection Standards (NBIS) and Bridge Management Systems (BMS) technology transfer, the status and future of bridge management systems and the role of the FHWA bridge engineer, and what is needed for a new regulation in the NBIS.



In summary, FHWA's bridge engineers enjoyed the opportunity to get together, renewing old acquaintances, meeting FHWA's new bridge engineers, and solidifying the role of the FHWA bridge engineer in helping to meet the challenge of keeping America on the move.

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(Continued from front page)
was recently approved by the American Association of State Highway and Transportation Officials (AASHTO) as test number TP60-00, "Standard Test Method for the Coefficient of Thermal Expansion of Hydraulic Cement Concrete." It is included in the

2000 edition of the AASHTO Provisional Standards.

The PCC Pavement Team researchers who developed the test at TFHRC are also using the test in-house to measure the T-coeff of concrete pavement cores from around the country. This data will

be included in the Long Term Pavement Performance (LTPP) database so that it can be used to help analyze current pavement performance, as well as design better pavements in the future.

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SAFETY

Connecticut Transition Passes Test

The Connecticut guardrail-to-bridge rail transition successfully redirected a pickup truck in a recent crash test. The pickup truck hit the transition at 100 km/h and 25 degrees and was redirected upright. The transition sustained moderate damage. The test results met the evaluation criteria in NCHRP 350.

Computer simulations have determined that the critical impact point on the Connecticut guardrail-to-bridge rail transition is where wheel snagging occurs



close to the end of the concrete parapet. So the first two posts of the transition were made with stiffer W200x19 steel-beam sections. These two special posts are each 2266 mm long and embedded 1560 mm into the ground. The remaining posts used in the transition were W150x13 steel posts, 1830 mm in length. A 100-mm-high asphalt curb ran along the length of the transition. A 100-mm-high curb under the rail helps keep the front wheel of the pickup truck from snagging on the posts. The curb was constructed

with an 80-mm sloped face. It was backfilled with crushed stone so that the wheel could not become trapped between the curb and the posts.

The Connecticut guardrail-to-bridge rail transition has nested W-beam rails and a channel rub rail mounted on steel posts with routed wood blockouts. This type of transition is very popular because it can be used to connect directly to a New Jersey-shape or F-shape concrete bridge rail.

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A test of the Connecticut transition successfully redirected this pickup truck with moderate damage to the transition.

DEMAAnDing Better Safety Through FHWA Software

A new tool was released in September 2000 to a limited number of in-vehicle information systems (IVIS) and advanced transportation information systems designers that will ultimately make the task of driving safer and easier. The new tool is the Design Evaluation and Model of Attention Demand (DEMAAnD), a prototype software package that predicts and evaluates how much workload and distraction in-vehicle navigation and driving display systems will cause for drivers.

Developed by FHWA and Virginia Tech Transportation Institute IVIS

researchers, the DEMAAnD prototype software was completed in Spring 2000 and was evaluated over the summer. The software is still in the prototype stage and has yet to be fully validated. However, customers for the software have been so earnest in requesting access to it that FHWA has decided to make the prototype available. The software is being distributed on CD-ROM, accompanied by a user's manual and final report on the project. FHWA will be contacting recipients of the CD-ROM within the next 4 months to make sure they received the software and to hear any comments or suggestions. FHWA is pleased with



The new software helps evaluate in-vehicle displays such as this.

the product and hopes that it will be valuable for IVIS designers in the automotive, auto supplier, and software industries.

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Pooling Funds for Better TMCs

In June, FHWA and 13 State DOTs convened the first meeting of the newly formed Transportation Management Centers (TMC) Pooled-Fund Study. Together they identified the human centered and operations issues facing their TMCs. Through the pooled fund study they are joining forces to create improvements in TMC design and operation. At this first meeting, they identified five projects that will be initiated.

The first project is the TMC Operator Requirements Matrix. This study will identify the knowledge, skill, and ability requirements for TMC operators;



operator requirements as a function of tasks; and comparable job descriptions in other industries. Documenting operator requirements will help TMC managers establish job descriptions to match documented job demands.

The second project, Transportation Management System Maintenance Concept and Plans, will document TMC maintenance planning practices. Study findings will provide guidance to TMC managers in assessing and meeting maintenance needs.

The third project is creating Guidelines for Variable Message Sign (VMS) Messaging. These

guidelines will form the basis for ongoing research into the human-factors foundation for VMS policies. The first phase of this study is documenting current VMS knowledge and practice.

There are two other projects being launched: one that will establish a TMC Pooled-Fund Study web site, and one that will examine TMC configuration management issues.

Current TMC Pooled-Fund Study members are FHWA, Arizona, California, Connecticut, Delaware, the District of Columbia, Florida, Illinois, Indiana, Kansas, Missouri, Nevada, New York, Rhode Island, and Virginia.

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Iowa National Model Wins Best Practice Award

The Iowa National Model was recently presented with the National Best Practice Award for State collection of crash data at the 26th International Traffic Records Forum in Portland, Oregon. The National Model is a partnership between FHWA and the State of Iowa to demonstrate the successful integration of technologies for data collection, management, and the communication of safety information.

The objectives of the National Model are to improve data acquisition for roadway incidents, leverage proven technology for law enforcement, streamline the communication of safety information to key stakeholders, and enhance the use of this information for safety programs. A software package has been developed



Members of the Iowa National Model Team received the National Best Practices Award.

for free distribution to public agencies that wish to upgrade existing and new data collection forms. Scanning tours to Iowa are being scheduled for 2001. The National

Model is also a recent recipient of the Hammer Award.

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FHWA Releases Version 2.0 of GIS Safety Analysis Tools

FHWA is pleased to announce the release of the GIS Safety Analysis Tools CD-ROM, Version 2.0. This product was developed by the Highway Safety



The new CD that is now available was produced for both safety engineers and GIS specialists.

Information System (HSIS). These tools improve the analytical features of HSIS by integrating geographical information systems (GIS) capabilities. The original version of the GIS Safety Analysis Tools was released in 1999 and provided practitioners with programs to perform spot/intersection analysis, cluster analysis, strip analysis, sliding-scale evaluations, and corridor analysis. The updated CD-ROM includes improved versions of the original tools and additional pedestrian and bicycle safety tools to select safe routes to schools, assess the bicycle compatibility of roadways, and define high pedestrian crash

zones. The new version is easier to install, includes additional documentation for several of the tools, and has greater capability to run in a Windows 95/98 environment.

The CD-ROM is designed so that users can explore the capabilities of the GIS-based highway safety analysis tools and adapt the applications to fit their own particular needs.

For more information about the GIS Safety Analysis Tools CD-ROM or HSIS, please contact:
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TECHNOLOGY TRANSFER

Local Road Coordinators Network Formed

A network of local road coordinators was recently established to build a stronger connection with FHWA's partners and customers in local governments. The division offices designated a contact to work with local road agencies and organizations. In addition, a point of contact in each State to represent the counties, municipalities, and townships has been identified. This local road coordinators network will allow FHWA and local governments to share ideas, programs, issues, and experiences to help local governments. "I believe this network will provide an excellent

opportunity to understand the needs of local road agencies, and by working with the local road coordinators and our partners in local government, opportunities can be created to meet those needs," said Joe Conway, Affiliates Program Team Leader, Office of Professional Development.

This network of contacts and coordinators offers strong potential for improving communication among local agencies, State departments of transportation (DOTs), FHWA, and Local Technical Assistance Program (LTAP) centers. The primary role of these

contacts and coordinators is to promote understanding among the agencies, aid in implementing the federal-aid program activities in which counties and local road agencies participate, and help introduce new technologies and innovations that can help the local roads programs. It is envisioned that meetings or forums will be scheduled between division offices, local representatives, and other local road associations to provide an opportunity to exchange ideas.

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MRC Website Hosts Directory of International Online Transportation Information Sources

Members of the Transportation Research Board's Committee A5017, Library and Information Science in Transportation (LIST), have compiled an annotated list of international transportation information sources online. Comprehensive in scope, it is divided into five parts: General/Multimodal, Air, Rail, Road, and Water. The international content focuses on Australia, Canada, Japan, and Europe (European Union current and candidate member states and European Free Trade Association member countries). Missing from this compilation are sources from the United Kingdom, some U.S. sources, and some international (non-national) sources.

A valuable aspect of "Sources Online" is the description of each website and its unique features. Additional information provided for each includes: title, address, telephone and fax numbers, email address, and website address. This comprehensive inventory is hosted on the Midwestern Resource Center's website, www.mrc.fhwa.dot.gov, under "Transportation Information Sources Online." The effort to compile this list was led by Ann R. Sweeney, librarian, webmaster, and information officer for the European Commission Delegation. As this is an ongoing project that the LIST committee continues to update and expand, comments or questions



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National LTAP Conference Held in Boise, Idaho

“**B**ridging the Millennium with New Ideas” was the theme of this year’s National LTAP Conference that was held July 30-August 2 in Boise, ID. Hosted by the Idaho Technology Transfer Center, this year’s conference provided an opportunity for customers and partners to come together and get feedback about LTAP.

Among the participants at this year’s event were international representatives from various countries, who not only attended but also presented portions of the program. John Horsley, Executive Director of American Association of State Highway and Transport-

ation Officials (AASHTO), also spoke about the intent of AASHTO to further support LTAP.

One favorite session of the participants was, “Things that Work for LTAP Centers/Hot Topics,” that was led by Gene Wilson, from the Wyoming T2 Center.

According to LTAP Manager William C. Evans, “This year’s conference was a great opportunity for the LTAP and Tribal Technical Assistance Program Community to come together with our US partners (AASHTO, NACE, and APWA) as well as our international technology transfer partners and share experiences.

This conference allowed all of us to expand our horizons for the new millennium.”

The LTAP meeting also provided an opportunity for the organizers of next year’s conference to meet and gather ideas. Next year’s conference will be an International Technology Transfer Symposium, held July 29–August 2 in St. Petersburg, FL. For more information on that event visit www.international.fhwa.dot.gov or send an e-mail to 2001symposium@fhwa.dot.gov.
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