RESEARCH & TECHNOLOGY
TRANSPORTER

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U. S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION

SAFETY

FHWA and NHTSA Develop Crash Analysis Tool

FHWA, in cooperation with the National Highway Traffic Safety Administration (NHTSA), developed a Pedestrian and Bicycle Crash Analysis Tool (PBCAT) through the University of North Carolina Highway Safety Research Center.

PBCAT is a software product designed to help state and local bicycle coordinators, planners, transportation engineers, highway safety researchers, and health safety officials improve pedestrian and bicyclist safety. PBCAT allows the user to develop and analyze a database that contains details associated with crashes between motor vehicles and pedestrians or bicyclists. Once a user enters the information to create their database, the software can generate reports and select countermeasures to address specific problems.

To be able to take actions to reduce the number of bicycle crashes and pedestrian crashes, researchers must know what events happened prior to a crash. Many states have computerized files describing crashes, however, the files are often not detailed enough to determine what factors contributed to the incident. Without those details, it is difficult to select appropriate countermeasures.

PBCAT includes a unique element—crash type—which describes the precrash actions of the parties involved. PBCAT helps users pull the detailed information from hard copy crash reports and generate pedestrian and bicycle crash types. The software can generate both tabular and graphical reports, which helps users understand the extent of their crash problems. Engineering, education, and enforcement are among the suggested countermeasures.

The first version of PBCAT is available on CD-ROM, which includes the software and a draft user's manual (FHWA-RD-99-192). Upon review by FHWA, the final CD-ROM, which will contain the software and a final version of the manual, is expected to be released in early 2000.

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Once a user enters the information to create their database in PBCAT, the software can generate reports and select countermeasures to address specific problems for pedestrian and bicyclists.

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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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INFRASTRUCTURE

FHWA Conducts Superpave Validation Study

Researchers in FHWA's Office of Infrastructure R&D conducted a study to validate the Superpave tests and specifications used to grade or rank asphalt binders and mixtures according to their resistance to rutting and fatigue cracking.

The Superpave asphalt-binder parameter for rutting is G*/sinδ. To obtain this parameter, the complex shear modulus of a binder, G*, and the phase angle, δ, are measured in the laboratory using a dynamic shear rheometer. When asphalt binders are ranked based on G*/sinδ at a high temperature, a higher G*/sinδ means that the asphalt binder should provide a higher resistance to rutting. Asphalt binders are graded according to rutting resistance based on the temperature that provides a G*/sinδ of 2.20 kPa.

For this study, researchers used FHWA's Accelerated Loading Facility (ALF)—a pavement-testing machine that applies one-half of a rear truck axle load. Each pavement has four test sites. Pavement test temperatures ranged from 46 to 76°C.

Three unmodified asphalt binders, two modified asphalt binders, and two aggregate gradations were used for the test. The pre-Superpave designations for the asphalt binders were AC-5, AC-10, AC-20, Novophalt™, and Styrelf™ I-D. The latter two binders were the modified binders. The Superpave Performance Grades of the five binders were 58-34, 58-28, 64-22, 76-22, and 82-22, respectively.

The relationship between G*/sinδ and pavement rutting was poor, however, the unmodified asphalt binders showed that the pavement life increased when the G*/sinδ increased. The main discrepancies were from the two modified asphalt binders. Based on G*/sinδ, the pavement with Styrelf should have performed better than the pavement with Novophalt at each pavement test temperature. However, in this study, the pavement with Novophalt was more resistant to rutting. No other asphalt binder property was found to provide a better correlation, which suggests that the effect of some asphalt binders on rutting cannot be assessed independently of the aggregates. The study

Close-up view of the ALF single wheel and tire.

provided no reason for changing the current 2.20-kPa criterion used to grade asphalt binders.

The study is detailed in the report *Validation of Asphalt Binder and Mixture Tests That Measure Rutting Susceptibility Using the Accelerated Loading Facility* (FHWA-RD-99-204). A summary of this study will be added to TFHRC's web site, *www.tfhrc.gov*.

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FHWA Conducts Modal Testing of Skewed Bridge

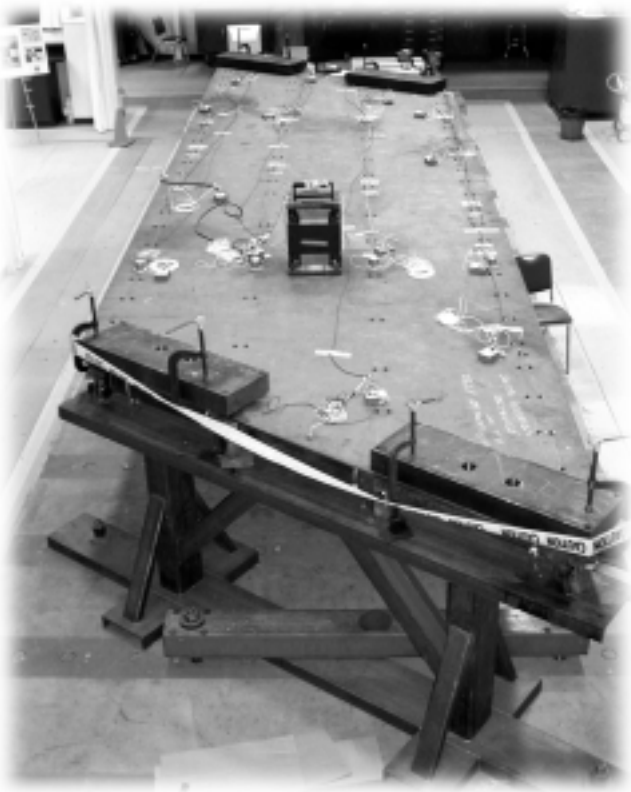
Junyi Meng, Hamid Ghasemi, and other FHWA staff developed and tested a scale-model of a skewed steel stringer bridge in the Nondestructive Evaluation (NDE) Laboratory at TFHRC.

The test evaluated both the static and modal response of the bridge. Modal testing is used to determine a structure's dynamic characteristics, such as frequencies, mode shapes, and damping. These dynamic characteristics change when the structure ages, becomes damaged, or has manufacturing flaws because the modal parameters are related to the structural properties of stiffness, mass distribution, energy dissipation, and non-linearity sources.

Experimental modal analysis involves three phases: test preparation (which may include modal selection, modal design, modal construction, instrumentation, and data acquisition); dynamic response measurements; and modal parameter identification.

Economic considerations and physical constraints prevented researchers from using a full-scale bridge. They chose a 2-span continuous-steel bridge model with an end-to-end length of 8.8 m (29 ft) and a width of 2.1 m (7 ft) with a 36 percent skew angle. The scale factor (ratio) is 1:6. The aspect ratio (ratio of pan/width) was 1.71, which limited the number of beams. Researchers used four 12.7-cm (6-inch) girders for the model.

Diaphragms were included in the 2-span bridge model. Steel structural tubing sections were chosen measuring 10 x 5 x .5 cm (4 x 2 x 3/16 in) for the diaphragms. A 95-cm (38-in) steel plate was used for the deck and was bolted to the girders with 0.9 cm (3/8 in) bolts.



A scale-model of a skewed steel stringer bridge instrumented for testing.

Loads were applied both horizontally and vertically to the structure. FHWA researchers Ron Nelson and Masoud Nasabzadeh devised special loading arrangement so that the horizontal loads could be applied (this arrangement has never been used before at the laboratory). Loads were applied to the model bridge vertically by pulling down on a cross-bar bearing on the beams. The vertical and horizontal vibrations took the bridge through its various modes and were applied with a shaker. Testing lasted 3–4 days.

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FHWA Co-Sponsors Wood in Transportation Conference

The National Arbor Day Foundation, for the first time, sponsored a national conference on the use of wood in transportation. USDA Forest Service, in cooperation with FHWA and the National Association of County Engineers co-sponsored the event held Nov. 4–5 at the Arbor Day Farm in Nebraska City, NE.

Sheila Rimal Duwadi of FHWA's Office of Infrastructure R&D and Edward Cesa of the Forest Service, Wood in Transportation Program discussed Federal programs in the area of timber bridge research, technology transfer, and demonstration projects. Michael A. Ritter of the Forest Service, Forest Products Laboratory presented information on timber bridge types, available preservative treatments, specification and standards, fabrication and construction, and available crash-tested bridge railings for use on timber bridges. Other presenters discussed timber pedestrian bridges, structural composite lumber bridges, and wood/fiber reinforced plastic composite bridges.

A glulam three-pin arch vehicular bridge, the first federally-funded glulam bridge in Nebraska, was dedicated at the close of the conference. It was funded under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) Timber Bridge Demonstration Program.

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This glulam three-pin arch vehicular bridge, located in Nebraska, was funded by FHWA through ISTEA's Timber Bridge Demonstration Program.

OECD Hosts Conference on Transportation Knowledge-Management in Latin America

The Organization for Economic Cooperation and Development (OECD) recently hosted a conference about the need for knowledge management in Latin America. FHWA and DOT's Bureau of Transportation Statistics co-sponsored the event with several international transportation-related organizations. It was held in Acapulco, Mexico, in November and was attended by nearly 150 transportation and information professionals from around Latin America and OECD member countries.

The conference emphasized the benefits of timely and systematic acquisition and dissemination of information about transportation. An objective of the conference was to determine what information transportation professionals in Latin America needed in order to have a well-functioning transportation system.

At the conference, presenters demonstrated the International Road Research and Documentation (IRRD) Program, a database housing information about transportation. Several Latin American countries have centers that contribute to the Spanish language version of IRRD, which was introduced in 1998. A goal of the conference was to increase the use of the IRRD by Latin American countries, as well as to increase the range and depth of contributions by the region to the system. IRRD is also available in English, French, and German.

The IRRD program is part of OECD's Road and Transport Research Program. The Road Transport Research Program also operates the International Road Traffic and Accident Database (IRTAD), which allows users to compare data from countries around the world.

Visit *www.oecd.org/transport*.
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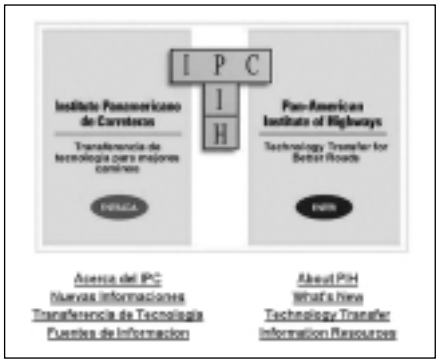
Pan American Institute of Highways Launches Bilingual Web Site

The Pan American Institute of Highways (PIH) launched a new web site that addresses technology transfer issues about roads in the Americas. PIH, which is based at FHWA in Washington, DC, has a network of 90 technology-transfer centers, 15 corporate sponsors, and more than 3,000 individual members in 21 countries.

The site *(www.pih-ipc.org)* complements the organization's efforts to transfer and share road technologies, practices, policies, and experiences among its membership. The information is available in both Spanish and English.

The site provides technical supplements on subjects pertaining to roads; has an interactive discussion area, which allows members and other visitors to exchange ideas on road-related topics; and encourages users to share information and match training opportunities and needs.

"PIH built this web site as an electronic focal point for our membership, and other visitors, to learn about technical innovations, talk to each other, and contribute their knowledge to the practice of road-building," said Antonio Nieves Torres, PIH's new executive director. "The site is also a place to keep up to date on our various activities, and to find out more about our membership programs," Nieves added.



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United States and Japan Compare Highway Technologies

In mid-November, FHWA hosted two Japanese delegations for concurrent workshops on advanced highway technologies and practices. The RD&T Service Business Unit (SBU) organized workshops as part of an ongoing cooperative relationship between the U.S. and Japan on road transportation issues.

The Safety R&D Office organized a workshop on pedestrian safety and nighttime safety. A delegation of five transportation officials from Japan's Public Works Research Institute and the Ministry of Construction attended the workshop at TFHRC, which was also attended by individuals from FHWA, NHTSA, and other organizations involved with pedestrian safety.

The teams highlighted comparative design and operational practices, innovations, and research for both areas. Japan, much like the United States, has pedestrian safety concerns regarding children, elderly, and the disabled. The U.S. team learned that Japan deploys considerable accommodations for pedestrians with disabilities. FHWA's engineers were impressed by the Japanese delegates' presentations of cutting-edge technology for nighttime safety research.

FHWA's researchers introduced the Japanese delegation to tools for pedestrian safety, such as Geographic Information Systems (GIS) to develop safe routes to school and crash-typing software. They also visited FHWA's Photometric Visibility Laboratory, where the program manager demonstrated the laboratory's capabilities.

The safety workshop included a field trip to Seattle, WA. Representatives from the University of Washington demonstrated the capabilities of a retroreflectivity van at the Washington DOT. Technical staff from the Seattle Engineering Department and Washington DOT gave the delegates tours of pedestrian facility improvements in Seattle and surrounding areas.

Japanese delegates visit Seattle and view a retroreflectivity van. (Pictured from left to right) Harumi Kikuchi, Elden Jacobson, Hiroshi Kasai, Kazuhiko Ando (kneeling), Makoto Nakamura, Katsuhiko Mitsuhashi, and Susumu Takamiya.

Concurrently, the Operations R&D Office hosted 14 ITS experts from Japan for a workshop on ITS activities in the United States and Japan. This workshop was the seventh in a series of seminars on ITS topics.

Japan's major R&D effort is called Smartway. The Smartway is defined as a road that incorporates essential facilities—such as a road-vehicle communication system, various types of sensors, and a fiber optic network—which can be integrated to provide various ITS services. The use of vehicle navigation systems and vehicle information and communication systems has been growing exponentially in Japan in the last few years. Japan has recently begun deploying electronic toll collection systems, and expects to install them at 730 locations around the country by the end of the year 2002.

The Advanced Highway System (AHS) in Japan strives to develop safer and more comfortable driving conditions and to reduce traffic accidents by providing drivers with real-time information about obstacles and crossing vehicles. Through communication between smart cars (vehicles with intelligence) and the Smartway (road infrastructure with intelligence), the researchers hope to eventually reduce accident rates by 50 percent. Japan will be undertaking major tests of these systems in late 2000.

The seven user services under

Japan's AHS include headway keeping, obstacle collision prevention, overshooting prevention, lane keeping, crossing collision prevention, right-turn collision prevention, and crossing pedestrian collision prevention.

Brief reports on the two 1999 U.S./Japan Workshops are available on the Internet at *www.international.fhwa.dot.gov*. For more information on road developments in Japan, please visit *www.japan-highway.go.jp/english/index.html*

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HPS Seminar Attracts a Diverse Community

Nearly 175 State bridge engineers, designers, academicians, fabricators, producers, and contractors gathered in Kansas City, MO, on Nov. 4–5, for a ground-breaking seminar entitled "Recent Advances in Steel Bridge Design and Construction with Emphasis on High-Performance Steel." This seminar emphasized the validity of using high-performance steel.

The seminar was sponsored by National Bridge Research Organization (NaBRO) and was co-sponsored by American Iron and Steel Institute, FHWA, National Steel Bridge Alliance, Nebraska Department of Roads, and Mid-America Transportation Center.

Speakers—including FHWA's research structural engineer Bill Wright—covered topics such as international perspectives, FHWA research studies, funding opportunities, AASHTO bridge-design specifications, innovative steel-bridge design concepts, and HPS bridge initiatives in the United States. Participants attended panel discussions about the future of HPS in bridge construction and the future of steel bridges. Transportation experts also discussed topics, such as training and constructability, concrete deck cracking, HPS and hybrid design, standard shapes/innovative shapes, and design/build.

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Highway Capacity Software Now Available

The EZ-HCS Highway Capacity Software Package for the Highway Capacity Manual has been completed by Odetics, Inc. for FHWA under a Small Business Innovative Research (SBIR) project. EZ-HCS takes the Highway Capacity Manual—the more than 40-year-old publication (last revised in 1997) that is still the most widely used transportation engineering document for capacity and operational analyses—and places the procedures from the printed piece into a computer program.

The program is a Java-based application and performs capacity analyses for the user. The output results, such as geometry, volume, and capacity, can be presented in a graphical or tabular format.

The program contains the five most popular modules of HCM: Chapter 3 (Basic Freeway Sections); Chapter 4 (Weaving Areas); Chapter 5 (Ramps and Ramp Junctions); Chapter 9 (Signalized Intersections); and Chapter 10 (Unsignalized Intersections).

For more information visit *http://www.odetics-its-east.com/*.

EzHCS input screens are designed to allow the user to input various data and view graphical representations of that entered data.

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PROFESSIONAL DEVELOPMENT

NHI Unveils New Logo and Slogan

The National Highway Institute (NHI) unveiled a newly designed logo and slogan intended to convey progress and change, while being mindful of NHI's tradition.

Coupled with the new logo is NHI's theme "Training Solutions for Transportation Excellence," a phrase that acknowledges the many ways of learning—ways beyond traditional classroom instruction. NHI's mission remains the same: help our customers select, develop, implement, and evaluate the training solutions that best meet their needs.

The logo and slogan will be printed in the new *Transportation Training Resources Catalog 2000.* The catalog lists NHI course offerings, as well as workshops and seminars offered by FHWA program offices and Resource Centers, and surface transportation training programs provided by other nonprofit organizations.

The catalog will be available at TRB's annual meeting held in Washington, DC, Jan. 9–13, 2000. Visit the NHI booth or contact Conni Morse for a copy at (703) 235-0534, or conni.morse@fhwa.dot.gov.

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