

# TranScan

Number 3, Spring 2001

NCHRP Project 20-36 • Highway Research and Technology—International Information Sharing

## *Innovative Traffic Control: Technology and Practice in Europe*

### Good Traffic Management Techniques Know No Bounds

Urban areas, no matter which country they're in, typically have one common characteristic—traffic, and lots of it. The techniques and strategies used to mitigate congestion, minimize delays, and improve traffic safety do, however, vary from one country to another. To take a look at how other countries are improving traffic operations and safety—and to identify techniques that might be useful in the United States—a team of U.S. traffic engineers traveled to Sweden, Germany, France, and England (for a team listing, see sidebar).

The team members classified their key findings into five categories: traffic control devices, freeway control, operational practices, information management, and administrative practices.



Tiger rail pavement markings on entrance ramp to freeway in England.  
Reprinted, with permission, from the Highway Agency, UK

#### Traffic Control Devices

Two European traffic control practices earned high marks from the team for potential application in the United States. The first is the tiger tail marking used on multilane freeway entrances and exits in England. At freeway entrances, the painted pattern creates a

highly visible, wide buffer between adjacent lanes and clearly indicates the merge point for each lane. Although entrance ramps using these markings must be longer and wider than typical two-lane ramps, safety is enhanced because the potential for conflict is reduced. At freeway exit ramps, tiger tail markings can help smooth traffic flow, reduce motorist stress, and increase exit capacity.

The second is the system of all-white pavement markings used throughout Europe, (although yellow is used in limited applications, such as work zone markings in Germany and France and intersection

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**Good Traffic Management**

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markings in England). In the US, in contrast, yellow markings have been used since the 1940s as no-passing lines, center lines, and left edge lines. The advantages of all-white markings include greater visibility, higher contrast, and lower costs. Team members caution, however, that three factors must be kept in mind when considering using all-white markings on US roads:

- Pavement marking patterns would need to be modified to provide a clear “menu” of messages (as is done in Europe),
- Drivers would need to be educated as to the meaning of the various types of all-white markings, and
- Highway agencies would have to devote greater attention and resources to designing, applying, and maintaining pavement markings.

“We were quite impressed by the quality of the pavement marking systems throughout the four countries we visited and how clearly the all-white markings communicated with drivers,” says team member Gene Hawkins.

**Freeway Control**

The team members recommended that three European freeway control practices—namely, variable speed control, lane control signals, and incident and queue detection and protection—be studied for possible implementation in the United States.

Variable speed control systems allow highway agencies to quickly respond to real-time traffic flows and weather conditions, using variable message signs to post reduced speed limits and advisories as necessary. Because motorists know that posted limits reflect actual conditions, rather than arbitrary limits, they are more likely to heed the speed limit. (The use of cameras to record speeders on some freeways also helps control speed variance.)

Lane control signals are also widely used on European freeways. These signals, mounted over each lane, typically use a red X, a green arrow, or a



Lane control signals on freeway in England.

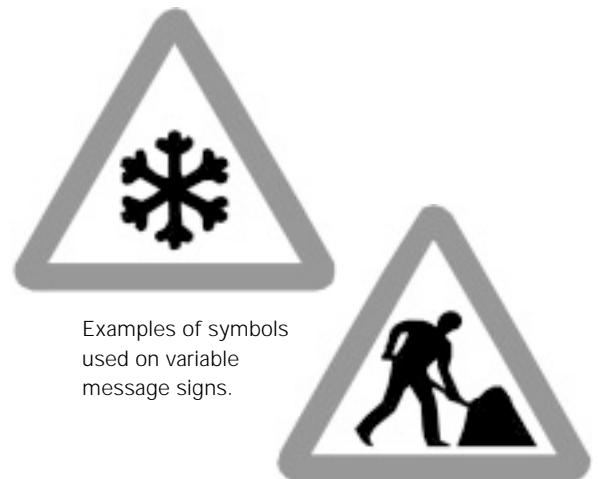
yellow diagonal arrow to indicate that the lane is respectively closed, open, or closed ahead.

Highway agencies in the four countries make significant use of sensors (primarily loops) embedded in the pavement. By monitoring traffic flow with these sensors, agencies can identify when and where queues have formed. That information can then be fed (in some cases, automatically) to variable message signs and other warning systems that alert motorists to a backup ahead.

**Operational Practices**

After learning about many promising traffic control practices of their hosts, the team members recommended that two techniques be considered for implementation in the United States.

The first is intelligent speed adaption, a technology that alerts a driver (with an audible in-car alarm) when he or she is exceeding the posted



Examples of symbols used on variable message signs.

speed limit. The system can also be set up to limit a vehicle's speed, making it impossible for a driver to exceed the posted speed limit. The technology, developed in Sweden, would have to undergo large-scale testing before it could be considered for use in the United States.

The second technique is self-optimized traffic signal control, in which the green phase is terminated and the right-of-way is reassigned at rural, high-speed, isolated intersections, allowing more efficient traffic flow while minimizing traffic risk. Although detection hardware for such a system could cost \$10,000 to \$20,000 more than a typical system, "a reduction in crashes would more than compensate for the extra costs," says Hawkins.

### Information Management

Timely, easy to read, and easy to understand motorist information is given a great deal of emphasis by European highway agencies. "We were impressed by the amount of information that the European agencies provide to road users," says Sam Tignor, team leader. Symbols, or pictograms, as they are called in Europe, are extensively used on variable message signs to indicate congestion, snow, danger, workers, slippery pavement, and other conditions. Geometric symbols are also assigned to detours or diversionary routes; the symbols are posted on variable message signs at each fork in the road, making it easy for drivers to follow. The team recommends that US highway agencies incorporate more symbols in variable message signs.

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## Team Members

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Note: titles and affiliations listed here were current at the time of the scanning tour (May 1998).

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“One of the most impressive examples of real-time travel information is in Paris,” says Tignor, “where more than 200 variable message signs are posted along the outer ring road and entrance ramps and the inner ring road.” These signs tell motorists how long (in minutes) it will take them to travel to a particular junction in the roadway. A French evaluation of this system found that two-thirds of motorists prefer signs that tell them how long they can expect to travel to point X, rather than signs that merely warn them of congestion ahead. “We in the US can learn from their example; we can do a better job of communicating with motorists,” says Tignor.

**Administrative Practices**

Transportation agency staff in the four countries visited routinely use marketing techniques to advance traffic engineering practice. For example, several countries stressed safety benefits and improved emergency response times when justifying new transportation programs; these improvements are much easier to “sell” to policy makers and elected officials than are the more general concepts of “congestion reduction” or “improved operations.”

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The full report, *Innovative Traffic Control: Technology and Practice in Europe* (Publ. No. FHWA-PL-00-021), is available from the Federal Highway Administration’s Office of International Programs (tel: 202-366-0111; fax: 202-366-9626; email: international@fhwa.dot.gov). The report is also available on the Web (international.fhwa.dot.gov/Pdfs/Innovtce.pdf).

NCHRP Project 4-28, Feasibility Study for an All-White Pavement Marking System, is evaluating the potential for implementing an all-white pavement marking system in the US. The feasibility of variable speed limits is currently being studied in NCHRP 3-59, Assessment of Variable Speed Limit Implementation Issues.

**About TranScan**

With this issue, *TranScan* resumes bringing you information on the international scanning missions sponsored by FHWA and AASHTO, but it now also includes news about PIARC committee activities (based on reports from US committee members), results of sponsored individual travel to international conferences and meetings, and activities of other international organizations, such as OECD and IRE. It will also occasionally include reports on other significant international activities by government agencies, universities, and private-sector companies.

Information that had previously been published in two other newsletters—*International Highway R&T Digest*, formerly published by AASHTO, and *International Road Notes*, formerly published by FHWA—is now incorporated into the broader editorial mission of *TranScan*.

*TranScan* is published under the direction of NCHRP Project Panel 20-36, “Highway Research and Technology—International Information Sharing.” (For a roster of panel members, see page 16.) The goal of Project 20-36 is to develop and promote a more coordinated and systematic approach to international information exchange and technology sharing by FHWA, AASHTO, and other major users and producers of highway research and technology.

*TranScan* is aimed at a broad cross-section of transportation professionals in all levels of government and in the private sector. It will be published quarterly and will also be posted on the Web ([www.nas.edu/trb](http://www.nas.edu/trb)). If you’d like to be added to the mailing list, please send your request to:

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## Committee and Meeting Reports

### World Road Association (PIARC)

The World Road Association (PIARC) programs operate on a 4-year cycle, culminating in a World Road Congress. Technical committees for the 2000-2003 period were established last year, in line with the goals set forth in the PIARC Strategic Plan. The next World Road Congress will be held in Durban, South Africa, in October 2003. More information on PIARC and the technical committees is available at [www.piarc.org](http://www.piarc.org).

#### Technical Committee on Surface Characteristics (C1)

*April 3, 2000—Paris, France*

*May 24, 2000—Nantes, France*

*January 11-12, 2000—Washington, DC*

*Based on a report by James C. Wambold, Pennsylvania State University*

The committee will study three topics during the 2000-2003 cycle:

- Surface condition indicators based on the needs of the user (with the user defined as highway agencies)
- Modeling of vehicle/tire/surface interaction—evenness, texture, noise, and friction
- Measurements of surface characteristics—to include an experiment in noise and further work on the first two experiments on friction/texture and profilers.

Roger Larson of the Federal Highway Administration was appointed the English-speaking secretary for the committee.

Bjarne Schmidt of Denmark was named chairman of the committee, replacing J.J. Henry of the US.

For more information, contact James Wambold (tel: 814-238-7185; fax: 814-238-5895; email: [jcw@psu.edu](mailto:jcw@psu.edu)).

#### Technical Committee on Interurban Roads and Integrated Interurban Transport (C4)

*March 6-7, 2000—Paris, France*

*June 21-22, 2000—Weinfelden and Zurich, Switzerland*

*Based on reports by James F. Byrnes, Jr., Connecticut Department of Transportation*

The organization meeting of the committee was moderated by Jean Paul Coste, secretary general of PIARC, P. Retour, deputy secretary general of PIARC, and M. P. Gandil, coordinator for Strategic Theme 2 (“Road Transport, Quality of Life, and Sustainable Development”) of the PIARC Strategic Plan.

The committee is one of four technical committees working under Strategic Theme 2 (which is one of five strategic themes guiding the policy and technical work of PIARC). Gandil provided an extensive overview of the work goals associated with Strategic Theme 2—namely, better knowledge of the social, economic, and environmental impacts of road transport policies, intermodality, and social acceptance of road projects.

Gandil stressed that there must be an economic linkage between road projects and ancillary economic activity, particularly in developing economies. He also pointed out that social impacts (such as health effects, social equity, and funding parameters in rural and urban areas) are increasingly being scrutinized, and environmental impacts must be evaluated. The availability of transportation services must be tailored to the needs of the users and adjusted for pricing levels and methods. The quality of services is important, and the key to gaining social acceptance of road projects is to provide comprehensive and detailed information on the relative impacts and benefits of various project alternatives.

The discussion then split into three topic areas: intermodality, road technology optimization, and acceptance of road development and cost management. Each group was charged with developing a draft work plan, with the goal that the work would

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**PIARC Meetings**

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be completed in time for the results to be published at the World Road Congress in Durban, South Africa, in 2003. The draft work plans were submitted to Gandil and will be brought to the PIARC governing body for approval. Once the approval is made, the work programs will be distributed.

The three work groups were organized as follows:

- Multimodal organization and global impacts of the interurban transport system. This group will deal with both passenger and freight transport. The term “interurban,” as differentiated from “urban,” will be discussed with Technical Committee C10.
- Optimization of the existing road network. This will focus chiefly on mobility, safety, and congestion.
- Development of the simplified evaluation framework. The work group will study both the strategic level and the project level, taking into account not only the decision criteria, but also how the criteria are applied and how the criteria vary from country to country.

For more information, contact James Byrnes at the Connecticut DOT (tel: 860-594-2701; fax: 860-594-2706; james.byrnes@po.state.ct.us) or Seppo Sillan at FHWA (tel: 202-366-1327; fax: 202-366-3988; seppo.sillan@fhwa.dot.gov).

### Technical Committee on Road Pavements (C7/8)

*April 4, 2000—Paris, France*

*Based on a report by Linda Pierce, Washington State Department of Transportation*

Committee 7/8 will concentrate on the design of flexible, mixed, concrete, and composite pavements, with particular emphasis on durability, economy, and environmental criteria. The committee will focus on design methods and standards; selection of materials, recycling, needs in materials; and maintenance and strengthening.

Five areas were initially identified as areas of study: criteria for selection of pavements, design methods and standards, selection of materials and recycling, rehabilitation and strengthening, and construction and control.

These five areas were then consolidated into three topic areas:

- Group 1
  - Criteria for selection of pavement/design methods and standards
  - Innovative pavement design
- Group 2
  - Selection of materials and recycling/construction and control
- Group 3
  - Help in choosing solutions in pavement rehabilitation
  - Recycling of pavements

Other topics discussed included quality control, labor-intensive construction, life-cycle costing versus limited budget, specifications for performance-based construction, and warranty specification.

For more information, contact Linda Pierce, Washington State DOT (tel: 360-709-5470; fax: 360-709-5588; email: piercel@wsdot.wa.gov).

### Technical Committee on Financing and Economic Evaluation (C9)

*April 12-13, 2000—Paris, France*

*July 6-7, 2000—Antwerp, Belgium*

*November 30-December 1, 2000—Cape Town, South Africa*

*Based on reports by Albert B. Ari of the New Jersey Department of Transportation and Sherri Y. Alston of the Federal Highway Administration's Office of Transportation Policy Studies*

Committee C 9's activities are covered by Strategic Theme 4, the goal of which is to “improve the performance of roads administration in the provision, operation, and management of road infrastructure and its use in accordance with international best practice.” The committee split into three working groups, with the task of identifying key issues that could form the basis for a work plan for the committee. The working groups were as follows:

- Economics of road assets, led by Ian Melsom of New Zealand
- Pricing and costing, led by Tom Worsley of the United Kingdom
- Financing, Fundraising, and Risk Sharing, led by Peter Struik of the Netherlands

Draft work plan outlines developed by the subgroups will form the basis for short papers that will be developed and distributed by the subgroup leaders prior to the next meeting.

Tom Worsley of the UK Department of Environment, Transport, and the Regions was nominated as the English-speaking secretary of the committee. Patrice Donzanvilliers of METL-SETRA in France was nominated as the French-speaking secretary of the committee.

At the July meeting, the committee continued to develop its work plan and discussed how to build linkages with other PIARC committees. The Department for International Development in London offered its assistance in organizing a committee meeting in a developing country or a country in transition.

The committee's products (scheduled to be completed by 2003) will include:

- update of a previous report on methods of economic evaluation of road projects
- article on economic benefits of information technology
- article on valuation of road assets
- workshop on economic evaluation of road maintenance
- paper on terms, concepts, and principles of costing and pricing
- report on estimation, measurement, and allocation of transport costs
- report on pricing instruments and regulations
- updated report on methods for evaluating public-private partnerships.

At the fall meeting, the committee further developed its work plan, which features a series of questionnaires to be completed by committee members and articles for *Routes/Roads*. Nazir Ali, executive director of the South African National Roads Agency, described his agency's program and the funding and institutional challenges that lie ahead.

The committee also agreed to work with Technical Committee 15 (Performance of Road Administrations) on developing an international seminar on road maintenance in Morocco in 2002.

The next C9 meeting will take place in Prague, Czech Republic, in May 2001. Sherri Alston of the Federal Highway Administration has been named committee chairperson.

For more information, contact Sherri Alston, Federal Highway Administration (tel: 202-366-9232; fax: 202-366-7696; sherri.alston@fhwa.dot.gov).

### Technical Committee on Road Bridges and Other Structures (C11)

*July 10-11, 2000—Bern, Switzerland*

*Based on a report by George Romack, Federal Highway Administration*

At its July meeting, the committee further developed its work plan, in line with the goal set forth in PIARC's Theme 4 (Management and Administration of the Road System). Work groups have been assigned in three topic areas:

- Asset management
- Performance management framework (economics)
- Bridge and other structure conditions

Each working group leader will summarize the information gleaned from questionnaires that are being sent to each member country, and a definition of asset management will be presented for discussion at the next meeting.

For more information, contact George Romack, Federal Highway Administration (tel: 202-366-4606; fax: 202-366-9981; george.romack@fhwa.dot.gov).

### Technical Committee on Road Safety (C13)

*February 28-29, 2000—Paris, France*

*June 4-6, 2000—Brussels, Belgium*

*Based on reports by Marion G. Waters, Georgia Department of Transportation*

Committee 13 falls within PIARC Strategic Theme 3, the goal of which is "to improve the safe efficient use of the road system, including the movement of people and goods on the road network, whilst effectively managing the risks associated with road transport operations and the natural environment." PIARC staff stress that the mission of PIARC is to serve as a support organization to further transportation services in emerging/developing countries. This is accomplished by identifying best practices, analyzing those practices, and documenting them in a format for implementation in other countries.

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### PIARC Meetings

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The June meeting included a field trip to the construction site of a multi-use transportation facility in the town of Leuven, Belgium. The site, adjacent to a bus/train station and a high-density residential and shopping area and sited along a heavily congested surface street, was designed to reduce motorists delays and provide additional parking, a covered transfer area for the buses, improved pedestrian access to the train and bus station, and office space.

The committee noted the following:

- The funding for the project came from multiple groups. For example, the parking was financed by the town, the office space and improved transfer facilities were funded by the transit company, and the roadway and tunnel were being paid for by the Ministry de Flemish (i.e., federal funds).
- The structure will be built on four levels—three of them below ground. The first level down will provide access to the parking facility, as well as tunnels that allow pedestrians to easily and safely reach the new office buildings and transfer areas. The second level down will consist of the parking garage. The third level down will house the roadway tunnel, as well as more parking spaces.
- A great deal of planning and compromise had gone into the design, to make it context sensitive.
- The project planners and builders were extremely sensitive to public opinion. An office was set up in a nearby office building to allow community residents to view scale models, reproductions, and pictures; the office was staffed with people knowledgeable about the design and construction, and who could conduct tours of the construction site. Most notably, the office was open seven days a week.
- Innovative construction methods were used in response to the community and to protect historic structures on site. For example, much of the underground structure was created from the top down, so that the construction was invisible to the neighborhood.
- Many of the items that would be required in the United States were notably missing, such as a monitored ventilation system in the tunnel and a traffic monitoring system for incident management.

On June 5, the formal meeting of the committee got under way. Several interesting statistics were presented during the welcoming remarks:

- Seventy-five percent of crash-related fatalities occur in developing countries.
- Crash-related fatalities are recognized less as a transport issue and more as a national health issue in developing countries.
- In most developing countries there are many health issues of greater concern than traffic fatalities. For example, the number of suicides in Hungary is three times the number of crash-related fatalities. It is widely believed that many of the single-car crashes may be suicide attempts.
- The use of seatbelts is directly related to the economic well-being of a country. For example, 90-95 percent of motorists use seatbelts in New Zealand; in contrast, only 25 percent (or less) of motorists use seatbelts in economically depressed countries.

Much of the discussion centered on how to transfer technologies and successful traffic safety practices to developing countries, particularly those countries in transition, where private automobiles are just starting to be generally used and where the opportunity for improvement is highest.

The committee then split into four groups to develop work plans.

For more information, contact Marion Waters, Georgia Department of Transportation (tel: 404-635-8038; fax: 404-635-8037; marion.waters@dot.state.ga.us).

### Technical Committee on Sustainable Development and Transport (C14)

March 8-9, 2000—Paris, France

Based on a report by Shari Schafflein, Washington State Department of Transportation

At its first meeting, the committee prepared a work outline, which included the following four topic areas:

- Climate change, mobility, and motorization—determine methods to assess the implications of greenhouse gas policies on transport and road policies.
- Ecotaxes—assess the impacts and uses of ecologically determined taxes on car use.
- Decision-making processes in the implementation of road transport policies—investigate decision-making processes and their development and recognition, and then promote effective tools to gain credibility in decision-making in road transport.
- Evaluation and limitation of impacts of transport policies—origin and evaluation of local transport impacts (existing roads and new highways) on health, local pollution, biodiversity, landscapes, and social liabilities.

An international survey will be distributed to collate information on policy instruments and best practices for these topics. A seminar on preliminary findings will be held in New Delhi November 8-10, 2001, and will include discussions with, and presentations by, regional representatives.

Subsequent committee meetings have been held in Helsinki, Madrid, and Vienna to implement the work plan.

Shari Schafflein was named English-speaking secretary to the committee.



For more information, contact Shari Schaftlein, Washington State DOT (tel: 360-705-7446; fax: 360-705-6833; sschaft@wsdot.wa.gov).

### Technical Committee on Performance of Road Administrations (C15)

*April 13-14, 2000—Paris, France*

*July 6-7, 2000—Vienna, Austria*

*November 16-17, 2000—Leiden, the Netherlands*

*Based on reports by Connie Yew, Federal Highway Administration*

The PIARC Strategic Plan 2000-2003 was a key topic of discussion at the Committee C15 meeting in Paris, France, on April 13 and 14, 2000. Jean Paul Coste, secretary general of PIARC, presented an overview of the plan, particularly those elements relevant to the committee's scope. The committee is classified under Strategic Theme 4, which has as its goal "to improve the performance of road administrations in the provision, operation, and management of road infrastructure and its use in accordance with international best practice."

According to Colin Jordan of Australia, Strategic Theme 4 is about the "effective and efficient management of inputs to, and operations of, the transport system to achieve outputs that lead to desired outcomes. It is concerned with the higher level management task of developing key elements of road agency capability to achieve international best practice."

Committee 15 is primarily focused on the organization of road administrations, joint partnerships, quality systems, optimal resource allocation, and procurement methods. Coste encouraged the committee to develop its work plan as soon as possible and emphasized PIARC's desire to see material presented and workshops organized as soon as possible.

Three broad work areas were adopted by the committee and assigned to work groups:

- Matching needs to outcomes
- Positioning of road administrations (the nature of relationships with government and other transport providers)
- Improving internal performance

At the July and November meetings, the committee further developed their work program for the next 4 years, concentrating their efforts in the three work areas listed above. A regional seminar focusing on reform and institutional strengthening is being planned for Morocco in fall 2002. Key topics are likely to include performance management framework and procurement. It was proposed that the seminar be held in conjunction with Committee 9's meeting on road maintenance, which is also scheduled for Morocco in fall 2002.

For more information, contact Connie Yew, Federal Highway Administration (tel: 202-366-1078; fax: 202-366-3411; connie.yew@fhwa.dot.gov).

### Technical Committee on Winter Maintenance (C17)

*March 20, 2000—Paris, France*

*December 4-5, 2000—Salzburg, Austria*

*Based on reports by Andrew Mergenmeier, Federal Highway Administration, and Patrick C. Hughes, Minnesota Department of Transportation*

This committee, formerly Working Group G1, met for the first time in March 2000. The change to committee status means that C17 will not only plan a Winter Road Congress, but also prepare at least two reports and several papers before the World Road Congress in 2003.

An agreement between PIARC and the government of Japan has been signed for the XI Winter Road Congress, to be held in Sapporo, Japan, in January 2002. The congress site has been selected, and marketing is proceeding on schedule. (More information is available at [www.piarc-sapporo2002.road.or.jp](http://www.piarc-sapporo2002.road.or.jp).)

A call for papers for the Winter Road Congress yielded 225 abstracts in 6 topic areas:


- Winter road policies and strategies
- Snow and ice management and its costs
- Winter road issues and traffic safety in urban areas
- Environment and energy
- Telecommunications technology
- Development of snow removal and ice control technology

Pat Hughes was selected as the assistant topic chairman for snow and ice management, and Andy Mergenmeier was selected as topic chairman for development of snow removal and ice control technology. After a review, 215 of the abstracts were accepted for presentation at the congress (including 7 from the US). Japan is proposing a special session with the theme "Snow, Roads, and Living." The 2-hour session would feature a panel of 6-7 elected or appointed officials (rather than engineers/practitioners), 2 of whom would be from the US. The discussion will focus on techniques and strategies for ensuring smooth and dependable winter road travel, which would improve the living environment, and hence the quality of life, in cold, snowy regions.

The committee is also preparing a glossary on winter road management. The document, which contains 160 terms/definitions in six languages (Russian and Japanese languages are being added), is intended to assist highway agencies in developing/transitional countries.

Nine countries have submitted information for the International Road Snow and Ice Data book being prepared by the committee.

The next meeting is scheduled for October 2001 (likely in Estonia or Italy).

For more information, contact Pat Hughes, Minnesota DOT (tel: 651-296-3156; fax: 651-296-6135; [pat.hughes@dot.state.mn.us](mailto:pat.hughes@dot.state.mn.us)). 

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## Sponsored Participation Reports

**N**CHRP Project 20-36 provided funds to support Robert Douglass's participation in the 2d International Symposium on Highway Geometric Design, held in Germany, and Mark Yashinsky's participation in the US/Turkey Workshop on Earthquake Engineering, held in Turkey. The following summaries are based on their reports from those meetings.

### 2d International Symposium on Highway Geometric Design

July 3, 2000—Mainz, Germany

Based on a report by Robert D. Douglass, Maryland State Highway Administration

Ezra Hauser of Canada opened this symposium with a thought-provoking presentation in which he stated that designing highways to meet standards is no guarantee that the roads will be safe. He argued that all standards, warrants, and guidelines should be based on the effect on crash rates, and he proposed that safety should be defined as the "expected frequency and severity of crashes." Using that definition, roads would not be classified as safe or unsafe, but rather as more safe or less safe. He suggested the following changes to the highway design process:

- Highway designers should have ready access to current information about the relationship between highway design decisions and their safety consequences.
- Highway designers should be trained (certified) in road safety and be educated in the relationship between highway design and safety.
- Highway designers should be given guidance from politicians and the public as to what level of safety to aim for.

Werner Brilon of Germany spoke about the lack of understanding about

drivers' actions, pointing out that drivers are not machines, and environmental design factors can cause drivers to react differently. He suggested site designs that would "provoke" drivers into reacting correctly.

European researchers and engineers suggested that speed is the most important variable in urban highway safety and that traffic calming and speed control were the key strategies for increasing safety. They also recommended that human factors play a key role in roadway design, standards, and safety.

A representative from the Transportation Association of Canada (TAC) presented new design guidelines, which focus on a range of geometric solutions and the safety implications of each. The TAC design guide looks at safety as a range of probabilities, rather than as a single, standard value.

The highway design and safety computer model—IHSDM—was the subject of a presentation by a representative of the Federal Highway Administration. IHSDM calculates the statistical safety benefits of various highway geometric design alternatives. Although still in the development phase, this model promises to be a comprehensive, interactive design guide.

The Dutch have adopted a goal of "sustainably-safe traffic" for urban main/distributor roads and access roads. The first step toward their goal of reducing accidents to a fraction of today's number is to characterize the function of each road type. Some of the issues they currently face include the following:

- Should pedestrian and bicycle mobility be restricted to increase safety (for example, by restricting mid-block crossing)?
- Should car speeds be reduced to accommodate other road users?

- Should car traffic be concentrated on a small number of roads, causing the environmental quality along those roads to be degraded?
- Should access to shops to restricted (for example, parking and deliveries) in order to improve safety?

Speed management is a common safety strategy in northern Europe, and many of the papers at the symposium dealt with this topic. Engineers from Finland presented a comprehensive analysis of the effectiveness of various types of traffic calming measures, including speed limits, roundabouts, humps and bumps, roadway narrowing and staggerings, signing, and rumble strips. They found roundabouts and bumps/humps to be the most effective measures for calming traffic. They also found that as vehicle speed increased above 40 kph (25 mph), so does a pedestrian's chances of death, thus reinforcing the notion that safety and speed reduction go hand in hand.

The Transportation Association of Canada's recently published *Canadian Guide to Neighborhood Traffic Calming* was also discussed. The report, produced in cooperation with the Canadian Institute of Transportation Engineers, recommends processes for developing traffic calming plans and engineering details for a wide range of traffic calming measures. The processes are very community oriented, and the key to achieving a plan acceptable to both the community and the highway authority is accurate performance data for various traffic calming measures.

In Ireland, traffic calming has been applied to interurban arterial roads in towns. The first step—creating gates and transition zones where traffic enters the town—was accomplished through a combination of narrowed carriageways, raised traffic islands, extended footpaths, im-

proved delineation between carriageway and parking, and environmental enhancements.

To see effective traffic calming measures firsthand, the symposium participants took a technical tour to the Neustadt neighborhood in Mainz. The City of Mainz is committed to pedestrian and bicycle transportation as a matter of public policy and treats pedestrians, transit, bicyclists, and cars as equals.

A new comprehensive guide to roundabouts has been prepared by the Netherlands, which has more than 1100 roundabouts. Joe Bared of FHWA presented a paper on the agency's new guide to roundabouts (more information on that report is available at [www.tfhrcc.gov/safety/00068.htm](http://www.tfhrcc.gov/safety/00068.htm)). The Dutch researchers also presented a concept of using lighted roadway markings that could be easily changed when necessary (such as at peak periods) to convert shoulders to travel lanes. They are also using vehicle simulators to test driver reaction to traffic markings and calming.

Researchers from the United Kingdom have concluded that the zebra crossing outfitted with build-outs (bump outs) to reduce the length of the crossing was the most effective pedestrian crossing (except in locations with high pedestrian volumes, where signalized crossings may be preferred).

Researchers in Sweden studying the use of a cable barrier along the center of two-lane rural roads with shoulders to create a two-lane road with passing zones have found good safety results.

(Information on ordering the symposium proceedings is available at [tti-trb.tamu.edu/symposium](http://tti-trb.tamu.edu/symposium)).

For more information, contact Robert Douglass at the Maryland State Highway Administration (tel: 410-545-8888; email: [rdouglass@sha.state.md.us](mailto:rdouglass@sha.state.md.us)).

National Cooperative Highway Research Program (NCHRP) Project 20-36 provides funding for travel costs for state highway agency representatives who have been invited to participate as a speaker, panelist, session chair or moderator at international meetings on highway technologies, but who are unable to do so because of funding constraints. Participants who receive travel funding are required to submit a trip report, which consists of a description of their involvement in the meeting, a summary of what they learned or accomplished at the meeting, a list of benefits that may be transferable to highway transportation practice in the US, and suggestions on how this information could be disseminated or implemented within the American Association of State Highway and Transportation Officials (AASHTO) and its member departments.

To ensure that the information gleaned by those participants is available to the entire US highway community, summaries of the trip reports are included here.

For more information on a particular meeting, contact the individual listed at the end of the meeting summary.

For more information on NCHRP Project 20-36, contact Chris Hedges at the Transportation Research Board (tel: 202-334-1472; fax: 202-334-2006; email: [chedges@nas.edu](mailto:chedges@nas.edu)).

### US/Turkey Workshop on Earthquake Engineering

*November 6-10, 2000, Ankara, Turkey*


*Based on a report prepared by Mark Yashinsky, California Department of Transportation*

The workshop, titled "Lessons Learned from Recent Earthquakes," was sponsored by the General Directorate of Highways (KGM), the Turkish Road Association (TCK), and FHWA. A key focus of the workshop was the expensive failure and near-collapse of the Bolu viaduct #1 and the collapse of the Bolu tunnels during the November 1999 Duzce earthquake. (The tunnels were about 70 percent complete when the earthquake hit.) Discussions centered on how to repair and retrofit the 2.3-km viaduct #1 and the 3.3-km tunnels so that they would survive a future earthquake. Engineers from the consulting firm that had designed and built the damaged structures were in attendance.

Engineers from California Department of Transportation (Caltrans) and FHWA provided instruction on seismic bridge design using specifications from AASHTO and Caltrans. They also described procedures for designing tunnels to withstand the effects of earthquakes.

Other presentations covered soil-structure interaction, facilities for testing very large damping devices, seismic retrofits for long-span bridges, pushover analysis, and repairing bridges after earthquakes [paper presented by Yashinsky].

This workshop addressed all aspects of highway damage, from seismicity to recovery. The workshop proceedings will be a valuable addition to the library of anyone concerned with bridges, tunnels, and earthquakes.

For more information, contact Mark Yashinsky at Caltrans (tel: 916-227-8719; fax: 916-227-8898; [Mark\\_Yashinsky@dot.ca.gov](mailto:Mark_Yashinsky@dot.ca.gov)). 

# In the Pipeline

The **Conference on Accessing International Transportation Information Resources Worldwide**, scheduled for July 29-31, 2001, is expected to draw about 100 leading information specialists, suppliers, and users to St. Petersburg, Florida. The conference, which will focus on road-related and intermodal information, will be part of the 2001 International Symposium on Transportation Technology Transfer (see below).

Sponsors include FHWA, TRB, Bureau of Transportation Statistics, AASHTO, Special Libraries Association, World Road Association (PIARC), and OECD/International Transport Research Documentation database.

Registration is \$300 before June 29, 2001 (\$350 afterwards). The conference will be held at the Hilton St. Petersburg. For more information, contact FHWA's Office of International Programs (tel: 202-366-9636; web: [www.international.fhwa.dot.gov](http://www.international.fhwa.dot.gov)).

The **Workforce Development** scanning team recently returned from an intense, two-week series of discussions with public agencies and private firms in Sweden, Germany, France, and England. The team was led by Joe Toole of the Federal Highway Administration and Pete Rahn, secretary of the New Mexico Department of Transportation.

A summary of the team's findings will be included in the next issue of *TranScan*.

Seven international scans are scheduled for 2001 and 2002:

- **International Freight Logistics**—May 25-June 01, 2001; Netherlands, Brussels, Italy, Germany. Team leaders: Harry Caldwell, FHWA, and Randy Halvorson, Minnesota DOT.
- **Contract Administration**—June 8-24, 2001; Portugal, Netherlands, France, United Kingdom. Team leaders: Dave Cox, FHWA, and Ron Williams, Arizona DOT.
- **Techniques for Pavement System Preservation**—July 6-22, 2001; France, South Africa, Australia. Team leaders: Tom Beatty, FHWA, and Frank Danchetz, Georgia DOT.
- **Ecosystem Management and Transportation/Reducing Wildlife Mortality on Highways**—October 5-21, 2001; Europe. Team leaders: Fred Bank, FHWA, and James Yowell, Kentucky Transportation Cabinet.

- **Highway Safety Improvement Programs in Europe**—fall 2001. Team leaders: Bud Wright, FHWA, and Terry Mulcahy, Wisconsin DOT.
- **Traveler Information Systems in Europe**—fall 2001. Team leaders: Bob Rupert, FHWA, and Jim Wright, Minnesota DOT.
- **Winter Maintenance**—January 2002; Japan. Team leaders: Paul Pisano, FHWA, and Rick Nelson, Nevada DOT.

In March 2001, the AASHTO Special Committee on International Activity Coordination and the FHWA Scanning Task Group selected **10 scan topics for fiscal years 2002 and 2003**. The scans are jointly funded by AASHTO and FHWA.

- Advanced technologies and winter operations management
- Policies, practices, and systems used to link safety-related databases into a comprehensive transportation safety information system
- Signalized intersection safety
- New methods in planning, environmental analysis, and design that will improve the environmental review process.
- Review of information technology in bridge management, bridge inspection, bridge rating, truck permitting and routing, and bridge analysis and design.
- Innovative technology for accelerated construction of bridges and embankment foundations
- Underground highway systems—construction, operations, and safety
- Performance criteria for asphalt pavement warranties
- Superior materials, advanced test methods, and specifications
- US/Latin America freight logistics

The 14th **International Road Federation World Congress** will be held June 11-15, 2001, in Paris, France. For information: [www.irfnet.org](http://www.irfnet.org).

The 5th **International Conference on Managing Pavements** will be held at the University of Washington, Seattle, from August 11 to 14, 2001. For information: [www.engr.washington.edu/~uw-epp/pavements/](http://www.engr.washington.edu/~uw-epp/pavements/).

## Tips and Information for Transportation Firms Interesting in Doing Business Internationally


Getting a toehold in the global economy can be daunting for small and medium sized US businesses. It's not easy learning how to compete in different cultures and amid unfamiliar regulations and customs. Companies thus often shy away from marketing beyond US borders. But with world trade growing at more than twice the rate of the US economy, the global marketplace is too valuable to overlook. The World Bank, for example, estimates that East Asia will invest about \$240 billion in transportation infrastructure between 1995 and 2004; Latin America will spend at least \$14 billion annually for transportation during that period.

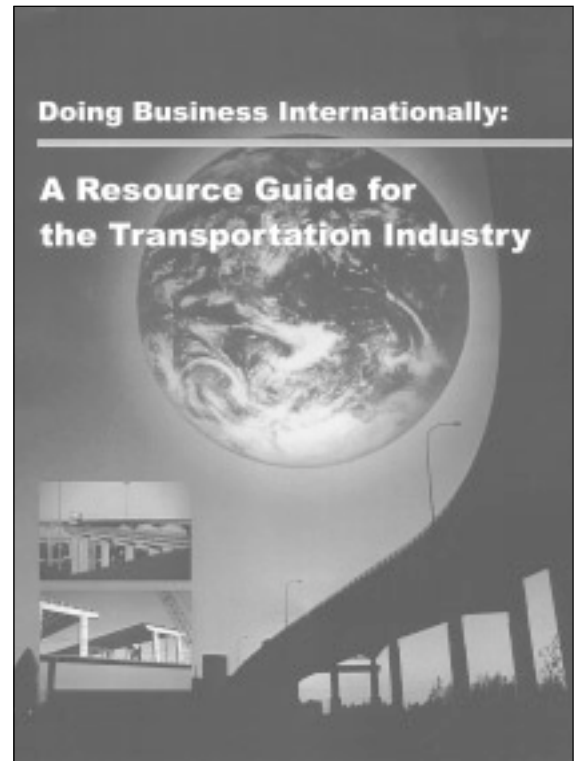
To help firms overcome the real and perceived obstacles to doing business overseas, FHWA and the American Road and Transportation Builders Association (ARTBA) teamed up to prepare a guide that describes the numerous resources available to small and medium sized firms interested in selling their goods and services abroad. The guide, *Doing Business Internationally: A Resource Guide for the*

*Transportation Industry*, helps companies learn how to:

- Find industry-specific and country-specific information and trade statistics,
- Explore financing options available through the US Export-Import Bank and other institutions,
- Track down sales leads,
- Deal with foreign governments and regulations, and
- Market goods and services through US-sponsored trade shows.

It also includes a list of associations and other resources on marketing internationally.

The publication is available from FHWA's Office of International Programs (fax: 202-366-9626; email: [international@fhwa.dot.gov](mailto:international@fhwa.dot.gov)). The publication is also available on the Web at [www.fhwa.dot.gov/international](http://www.fhwa.dot.gov/international). 



### Abbreviation Key

|        |  |
|--------|--|
| AASHTO | American Association of State Highway and Transportation Officials |
| FHWA   | Federal Highway Administration                                     |
| NCHRP  | National Cooperative Highway Research Program                      |
| TRB    | Transportation Research Board                                      |
| DOT    | Department of Transportation                                       |
| PIARC  | World Road Association   |
| OECD   | Organization for Economic Cooperation and Development              |
| IRF    | International Road Federation                                      |

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*TranScan* (ISSN 1095-5593), published periodically by the Transportation Research Board, reports news and information resulting from National Cooperative Highway Research Program Project 20-36, Highway Research and Technology—International Information Sharing. This publication is also available through the Internet ([www.nas.edu/trb](http://www.nas.edu/trb)).

The Transportation Research Board is a unit of the National Research Council, a private, nonprofit institution that is the principal operating agency of the National Academy of Sciences and the National Academy of Engineering. Under a congressional charter granted to the National Academy of Sciences, the National Research Council provides scientific and technical advice to the government, the public, and the scientific and engineering communities.

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