International Technology Scanning Program

Bringing Global Innovations to U.S. Highways

US Department of Transportation
Federal Highway Administration

Office of International Programs
January 2002

International Technology Scanning Program: Bringing Global Innovations to U.S. Highways

Iowa snowplow operators use air and pavement temperature sensors to calculate the ideal time to apply chemicals that keep roads from freezing. Bicyclists in Phoenix pedal safely alongside traffic in lanes designed especially for them. State highway departments across the country pave with heavy-duty asphalt that resists rutting, even on the most congested arteries.

Each of these innovations got its spark from the International Technology Scanning Program, which links U.S. highway experts with their counterparts around the world to learn about the newest approaches to transportation policy and highway operations, planning, design, construction and maintenance. The goal: to see if any of these approaches have application in the United States. The program allows the American transportation community to learn from the successes, as well as the failures, of other countries. It helps experts avoid duplicative research and development and accelerates improvements to U.S. transportation.

The program is a joint effort of the Office of International Programs of the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO), in collaboration with the Transportation Research Board's National Cooperative Highway Research Program. The organizations work together to identify priorities, organize scanning studies and help implement key findings.

Scanning studies give U.S. experts a first-hand look at transportation advances around the world that can result in better, safer roads at home.

Better Roads for U.S. Drivers

The scanning program offers many benefits. It allows transportation departments to put the latest technology into practice more quickly without spending scarce research dollars to recreate advances developed in other countries. It helps the United States remain economically and technically competitive by providing access to the results of research and implementation programs beyond its borders. It facilitates joint research and technology-sharing with other countries, further advancing transportation innovations around the globe. Ultimately, the program provides better, safer and more environmentally sound transportation for the American public.

The scanning program saves research time and dollars while bringing the latest technology to U.S. roads.

FHWA launched the current program in 1990 with a study of European asphalt pavement innovations, but the concept of looking abroad for innovations that can be used at home is not new. For more than a century, FHWA and its predecessors have recognized that much can be learned from observing how other countries solve highway-related problems. Back in the 1890s, the State Department conducted a study that confirmed what good roads advocates had been saying for years: European roads, particularly France's centralized highway system, were in much better shape than those in the United States.

During World War I, millions of American soldiers, including future President Harry S. Truman, got a close look at the French roads and came back convinced the United States could do at least as well. The German autobahn's role in enhancing that country's military effort early in World War II and the Allied counterattack at the end inspired another future president, Dwight D. Eisenhower. It was during his administration in the 1950s that America inaugurated the Interstate Highway Program, the greatest public works project in history.

More recently, the Intermodal Surface Transportation Efficiency Act assigned FHWA the responsibility of identifying worthwhile technologies overseas with a view to implementing them at home. The scanning program has proved to be an efficient, cost-effective way to meet this responsibility.

Here's how the program works: FHWA and AASHTO carefully select high-priority scan topics and teams of U.S. experts. The teams travel to Europe, Japan, Australia, New Zealand, Canada, South Africa and other countries that are leaders in transportation innovation and practice. They meet with officials and gather information about the scan's topic – which typically relates to technological advances, management practices, organizational structure, program delivery and financing. In their exploration, teams work from a detailed list of questions compiled before the trip. They also draw from preliminary research and information on the topic gathered during the office-based study that precedes many trips.

While the makeup of teams varies from one scan to the next, participants usually represent FHWA, State departments of transportation, local governments, transportation trade and research groups, academia and the private sector. Team members are selected for their expertise on the scan topic, as well as for their ability to help put the most promising innovations into practice.

Back in the United States, team members evaluate their findings and develop comprehensive reports, including recommendations for further research and pilot projects to verify the value of adapting innovations for U.S. use. In particular, teams identify innovations that offer solutions to transportation problems, improve performance or reduce costs. Team findings complement and enhance the U.S. transportation community's knowledge base, often putting innovations on the fast track to deployment.

With the help of team members, information about scan findings and results of pilot programs and research are circulated throughout the country to State and local transportation officials and the private sector. But the information exchange does not stop at the border. Through published reports, presentations and the internet, the international transportation community can access the findings of U.S. scanning teams.

Over the past decade, 50 teams of experts have observed global innovations ranging from safety measures for bicyclists to intelligent transportation systems.

Since 1990, nearly 50 teams of experts have traveled overseas in the quest for new knowledge. They have studied pavements, bridge construction, contracting techniques, winter road maintenance, safety, intelligent transportation systems, environmental issues, planning and policy. Scanning studies have exposed transportation profes-

Heavy-duty stone matrix asphalt, first used in Europe, is now the top pavement choice for heavily traveled U.S. highways.

sionals to remarkable advancements and inspired implementation of hundreds of innovations. The result: large savings of research dollars and time, as well as significant improvements in the nation's transportation system.

Longer-Lasting Pavement

When a team of pavement experts visited Europe on the first scanning study, the technology that impressed them most was stone matrix asphalt. They found this innovative pavement mix, a strong stone skeleton held together by a rich asphalt cement, used widely in Europe for its ability to withstand rutting on heavily traveled roads. After the scan, government and industry experts formed a Technical Working Group to evaluate the asphalt mix and develop specifications for its use in the United States.

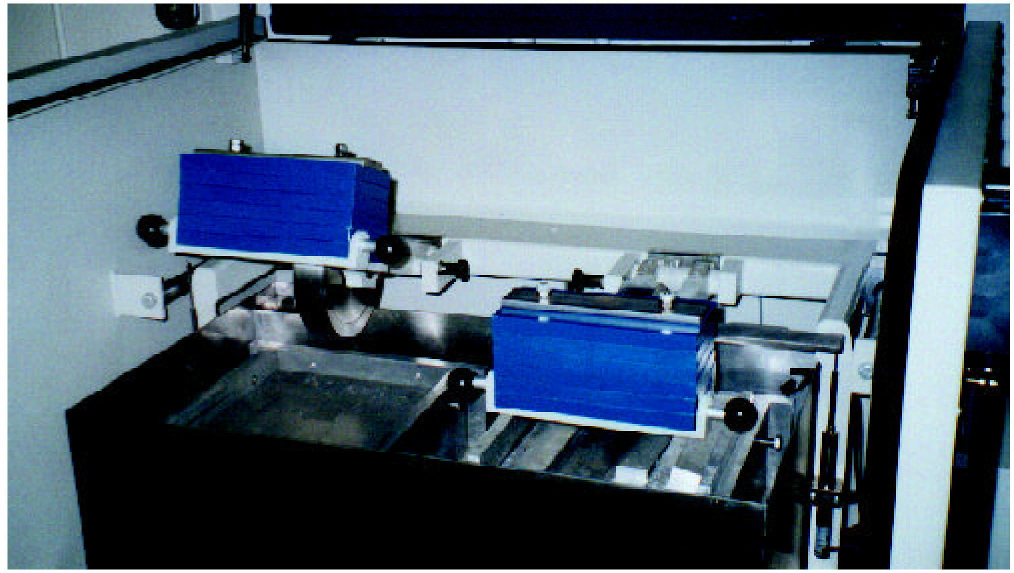
Stone matrix asphalt is now the premier solution for U.S. roads subject to heavy loads and high traffic volumes. About 15 million tons have been used on more than 250 projects in 25 States, and surfaces paved with the mix are projected to last up to 20 years with minimal maintenance. "It has become the preferred premium pavement surface," observes Technical Working Group Secretary John Bukowski of FHWA. "There is a tremendous amount of interest in using stone matrix asphalt in the United States because it lasts a long time without maintenance."

Larry Michael of the Maryland State Highway Administration, who first examined stone matrix asphalt when he participated in a 1992 follow-up visit, has become a strong advocate of its use on U.S. roads. Maryland has spread 3 million tons of stone matrix asphalt on its highways, more than any other State. "It is without a doubt the most tenacious mix I have ever seen," maintains Michael. "It is almost impossible to make it rut and it will outlast any other mix."

Scanning studies also yielded new ideas on testing pavements for strength and durability. As a result, nearly 20 States and universities now have accelerated load facilities for pavement testing. These facilities allow engineers to try new pavement mixes under controlled conditions, improving performance and lengthening the life of pavements while saving time and money. FHWA procured European laboratory equipment for its Turner-Fairbank Highway Research Center in Virginia and the Colorado Department of Transportation after scan teams saw the equipment in action.

Colorado has a French rutting tester, which assesses the ability of hot mix asphalt to withstand rutting, and a German wheel-tracking device, which evaluates asphalt's susceptibility to both rutting and moisture. The Colorado DOT uses the equipment to benchmark asphalt quality and test potential changes in mix specifications. "There has been quite an improvement in our asphalt mixes based on our test results since we first obtained the equipment," says Tim Aschenbrener of the Colorado DOT.

The United States has a long history of pavement testing that precedes the scanning program, but Aschenbrener credits the overseas scans with



Laboratory testing equipment innovations from Europe allow U.S. engineers to develop better-performing pavement mixes under controlled conditions.

increasing the role of such equipment as wheel-tracking devices. An American-made asphalt pavement analyzer is now used in several States. "Its development, popularity and implementation were accelerated by the way the Europeans analyze asphalt with wheel-tracking devices," Aschenbrener says.

Gerry Huber of Heritage Group in Indianapolis, Ind., agrees. "What scanning teams learned overseas contributed to our knowledge base in the United States and improved the way we test pavements today," he says. "The greater access we have to new technology around the world, the faster we can make technological advances here. The scanning studies gave us the incentive to evaluate and employ cutting-edge equipment for all sorts of asphalt testing."

U.S. experts observed the use of automated steel fabrication plants to build high-quality, cost-efficient bridges in Japan.

Scanning studies accelerated the use of high-performance concrete to build longer-lasting bridges that suffer less damage from traffic and weather.

World-Class Bridges

Keeping the nation's bridges in safe, serviceable shape and replacing them when necessary is a huge job for highway departments. When bridge experts visited Canada, Europe and Japan to see the latest in bridge construction and maintenance, they found a wealth of ideas on innovative contracting methods, new construction techniques and high-tech materials. Many of those advances are now being used in the United States to reduce construction costs and make bridges stronger, safer and more durable.

Among the technologies they studied is high-performance concrete, which is engineered to provide greater durability and strength than conventional concrete. That means high-performance concrete bridges last longer and suffer less traffic and weather-related damage, resulting in lower maintenance costs. They also can cost less to build, since they often require fewer supports.

The American building industry has used high-performance concrete for years, but scanning studies helped accelerate its adoption for bridge construction. FHWA partnered with the Transportation Research Board to develop parameters for high-performance concrete and provide technical assistance on bridge-building projects. Since then, States and localities have built more than 50 high-performance concrete bridges.

The first bridge project in the country built with high-performance concrete in both the superstructure and substructure was the Louetta Road Overpass in

Houston, Texas. After building a second overpass project in San Angelo, the Texas Department of Transportation developed specifications for using a high-strength version of the concrete on future bridge jobs.

“We use high-strength high-performance concrete when geometrical constraints require longer spans, shallower beams or wider beam spacings,” says the Texas DOT’s Kevin Pruski. “This gives us additional flexibility in our designs, allowing us to use prestressed concrete beams in situations where, in the past, steel girders may have been required.”

Observing the latest cable-stay bridge technology overseas helps U.S. transportation professionals build aesthetically pleasing, safer and more durable bridges at home.

The State has used normal-strength high-performance concrete on about 200,000 square feet of bridge decks to provide greater durability than conventional concrete. “FHWA’s leadership in the high performance concrete implementation program has resulted in Texas looking directly at durability performance characteristics rather than relating durability to strength characteristics,” Pruski says. “We believe this is a huge step forward in constructing structures with better long-term performance.”

Another technology U.S. experts examined overseas is advanced composite materials, including fiber-reinforced polymers and polymer matrix composites. Developed originally for the aerospace industry for their strong but lightweight qualities, composites hold promise for structural rehabilitation of bridges, both to strengthen deficient bridges and retrofit bridges to withstand earthquakes.

Seeing advanced composite materials used on foreign bridges gave scan team members confidence that the technology could work back home. Since then, U.S. experts have accelerated research on composite materials for bridge applications and are now sharing their findings with their counterparts in Europe. FHWA has worked with several States on projects, including replacing a bridge deck with composite materials in New Hampshire and using fiber-reinforced polymers to strengthen bridge columns in Utah.

Scan teams also studied automated bridge fabrication in the United Kingdom and Japan. Team members were impressed with the increased speed, improved quality and lower costs they saw in such technologies as computerized assembly and testing systems. These simulate erection of complicated structures and eliminate the need for shop assembly of bridges. While the United States has used automated fabrication in automobile manufacturing and shipbuilding for years, experts are now researching its application in bridge fabrication.

Geotechnical Advances

Using a technique to reinforce earth walls known as soil nailing can save time and money on highway construction projects. While this was not news to U.S. geotechnical specialists, European scans boosted their knowledge of the research and design principles behind the technology and greatly expanded its use in this country.

Soil nailing involves strengthening an excavated slope by installing closely spaced steel bars in the slope as construction proceeds from the top down. This process creates a soil mass stable enough to retain the ground behind it safely and keep it from collapsing. It allows construction of steeper walls in smaller areas, saving right-of-way procurement and construction costs as well as time.

Soil-nailing technology from Europe has resulted in more than 500 installations in the United States with an estimated $100 million savings in construction and right-of-way costs.

Scans helped close the gap in U.S. research on soil nailing, which is now routinely integrated into highway construction. FHWA has published several technical documents, sponsored a demonstration project and provided assistance to numerous State transportation departments to assure economical design and quality construction of soil nail walls. As a result, more than 500 soil nail walls have been completed in the United States with an estimated $100 million savings in construction costs.

The leading State in the use of soil nail walls in highway construction is California, where more than two million square feet of wall face have been built using the technology. The State uses soil nailing for both permanent and temporary retaining walls, according to John Ehsan of the California Department of Transportation.

"Soil nailing is most cost-effective when used on larger projects that would require considerable excavation using conventional methods," Ehsan says. On a wall 30 feet high, soil nailing saves the State as much as 40 percent in construction costs. "You can do a lot more with soil nailing than with traditional methods," Ehsan adds. "You can build a taller wall. You can build any shape wall. You can make it look exactly like rock, so it's more aesthetically pleasing."

Reports from FHWA on how European engineers used soil nailing were helpful when California was developing a computer program for designing soil nail walls. "It would have been much more difficult to do without that information," Ehsan said. "But now that we've done a lot of work with soil nailing, we probably have more experience with it than they do overseas."

Scan teams found that many snow and ice removal techniques used in other countries could be adapted easily to U.S. roads.

Building Better Snowplows

When a scan team visited Europe and Japan to see how they handle snow and ice removal, they discovered important advances in controlling the effects of winter weather on driving conditions. The team also determined that much of what other countries were doing could be adapted fairly easily to American use.

Team members observed, for example, that pre-wetting and using finer grades of anti-icing chemicals kept more material on the road and saved a third of the amount normally used. They also learned that attaching a canvas shield to a snowplow diverts overspray under the truck, protecting the radiator and windshield. As a result of adopting and enhancing these and other ideas, Snow Belt States have narrowed the winter maintenance technology gap with their overseas counterparts.

The scan inspired Iowa, Minnesota and Michigan to form a consortium to design and build snow removal equipment with the latest technology. The snowplow features a global positioning device, high-intensity lights, anti-icing equipment that handles both liquid and granular chemicals, a friction meter that measures road slipperiness, and reverse-obstacle sensors that apply brakes automatically.

This concept vehicle features intelligent transportation technologies observed in Japan and Europe, including global positioning systems and temperature-sensing instruments.

The plow also has a sophisticated sensor system that allows more accurate predictions of when pavement temperatures will dip below freezing, making it possible to fine-tune chemical use. "With this proactive approach, snowplow operators are getting just the right amount of chemical down at the right time," says Lee Smithson of the Iowa Department of Transportation, which has equipped 18 trucks with the new technology. "The roads are at a better level of service and we can save on chemicals."

Also as a result of the scan, AASHTO established the Snow and Ice Cooperative Pooled Fund Program to evaluate and share information on winter maintenance technologies. Members include 35 States, the American Public Works Association and the National Association of County Engineers. The group conducts workshops, develops manuals and computer-based training programs, and maintains an information exchange for snow and ice experts across the country.

"I can't imagine how long it would have taken us to get to the point where we are if we hadn't discovered things that were already being done internationally. It saves us an enormous amount of research effort and time," Smithson says. "One thing leads to another and all of a sudden we've got a better mousetrap all around."

Innovative Contracting Techniques

There's more than one way to build a road. That's why a scanning team went to Europe to learn more about contracting techniques other countries use for highway jobs. They looked at how these techniques save time and money, improve quality, and reduce inconvenience to motorists during construction. Their findings kindled a national discussion among highway experts on innovative contracting practices and prompted FHWA to develop a special program that has enabled at least 40 States to try new techniques.

One practice several States now use is lane rental, which requires contractors to pay rent on lanes they block during construction. Rental costs normally are based on traffic density and impact on road-user costs, with higher rental rates for times when traffic is heavy and lower rates when traffic is light. This gives contractors an incentive to minimize the time the driving public is exposed to travel delays.

Another technique is cost-plus-time bidding, which requires contractors to estimate the number of days to complete work and incorporate it into the bid. The California Department of Transportation used cost-plus-time bidding on 10 projects during reconstruction of freeways damaged by the Northridge Earthquake. The bidding technique reduced total contract time for all 10 projects by 450 calendar days and saved nearly $48 million in road-user costs.

Many States now add warranty clauses, used extensively in Europe, to highway construction contracts to assure project quality. A warranty requires a contractor to guarantee the integrity of a roadway, structure or other work product for a specified time and outlines responsibility for repairing or replacing a defective product. The hundreds of warranties now in effect on American highway projects cover items such as pavement performance and bridge painting.

Design-build contracting is another technique observed in Europe that is attracting growing interest for highway construction in the United States. By combining project design with construction, design-build contracting allows projects to be completed more quickly than traditional contracting methods. It also makes it easier to integrate construction with design because it allows the contractor maximum flexibility in selecting design, materials and construction methods.

“Adoption of the design-build method of project delivery offers major benefits to highway development. It’s similar to U.S. business embracing computers to advance efficiency and productivity,” says Tanya Matthews of the Design-Build Institute of America in Washington, D.C. “Not only does design-build bring the designer and constructor together to foster innovative ways to develop projects, it can accelerate a project schedule to meet a critical, time-sensitive goal.”

Design-build contracting combines project design with construction to save time and allow greater flexibility on complex highway projects, like this multi-lane expansion on I-15 in Utah.

Two-dozen States and several localities have adopted design-build techniques to save time on complex projects. In one of the largest highway design-build efforts in U.S. history, a 17-mile stretch of Interstate 15 through Utah's Salt Lake Valley was transformed from a congested, deteriorating six-lane highway into a 12-lane superhighway. Design-build contracting helped the Utah Department of Transportation finish the job under budget and ahead of schedule – in plenty of time for the 2002 Winter Olympic Games.

Planning for Today's Travelers

Transportation experts recognize a growing need to design roads that fit their physical setting and preserve the environment while maintaining safety and mobility for travelers. One name for that approach to planning is context-sensitive design, which considers the total context in which a transportation project will exist and tries to achieve a balance among the factors involved. The intent is to create transportation systems that integrate roadways smoothly into communities and the environment.

Scan teams visiting Europe found many ideas for improving bicyclist and pedestrian safety in the United States.

Scanning team members encountered this context-sensitive approach to planning and design in several European countries, where planners use a collaborative process involving a variety of stakeholders to develop transportation projects. As a result of the scan, U.S. and European experts have exchanged information and ideas to expand knowledge of this design process on both sides of the Atlantic.

Two categories of travelers that get special attention in many European countries are bicyclists and pedestrians, whose concerns are included in every element of transportation planning. From car-free zones to urban bike paths to traffic signals with infrared sensors that detect the presence of pedestrians, European innovations offered many ideas to a scan team for improving bicycle and pedestrian facilities in the United States.

Since the scan, planning techniques and safety features for cyclists and walkers have been the subject of workshops across the country and a comprehensive FHWA report. The Minnesota Department of Transportation developed a bicyclist and pedestrian safety demonstration project in the city of Hutchinson. Several cities, including Los Angeles and Rochester, N.Y., have installed automated pedestrian detectors.

Another city that has put European design ideas into practice is Phoenix, which boasts 412 miles of bicycle lanes on a 3,945-mile street system as well as an impressive sidewalk network. Among the safety techniques Phoenix has adopted are landscaping between streets and sidewalks to add a buffer between pedestrians and cars. It also was one of the first cities in the country to equip all of its buses with bike racks. The measures earned Phoenix recognition from *Bicycling* magazine as one of the top 10 U.S. cities for biking.

"The primary thing we brought back from the scan was the confidence that these techniques work," observes Michael Cynecki of the city's traffic department. "We had been planning to use a number of them in Phoenix, but we did not have the experience with them that traffic engineers in other countries had. Seeing them in use gave us the confidence to go ahead. As a result, Phoenix has become a much more bike- and pedestrian-friendly city."

Traffic calming and context-sensitive design techniques in Phoenix, such as lane narrowing and bicycle lanes, use the roadway itself to reduce traffic speeds instead of police enforcement.

Designing Safer Roads

Traffic – and lots of it – is a common characteristic of urban areas around the world. As highway congestion surges, transportation experts seek new ways to accommodate increased demand while enhancing safety. U.S. traffic engineers traveled to Europe to take a look at how other countries are improving traffic operations.

Among the practices they observed was traffic calming, a collection of technologies that reduce traffic speeds through residential or highly dense pedestrian

Separated bicycle lanes in Europe encourage increased bicycle use in urban areas while protecting cyclists from the flow of vehicular traffic.

areas. They include speed humps, roundabouts, lane narrowing and other methods that use the roadway itself to control speed instead of police enforcement.

States and localities across the country have adopted ideas scan teams brought back. Speed enforcement techniques, such as photo radar to combat aggressive driving and cameras to catch red-light runners, are used in many urban areas. Several States have implemented variable speed limit programs in which speed limits are adjusted as traffic and weather conditions change, resulting in better traffic flow and increased safety.

Variable speed limit signs, first observed on a tour of European highway operations, allow speed limits to be adjusted as weather conditions change on Washington State highways.

Two European traffic control practices that earned high marks from teams for potential U.S. application are under study. One is tiger tail marking, a painted pattern used on multilane freeway entrances and exits that creates a buffer between lanes and clearly indicates the merge point for each lane. Another is all-white pavement markings, which offer greater visibility, higher contrast and lower costs than traditional yellow-and-white markings.

One State that has been aggressive in adopting safety technology is Washington. It has installed such innovations as traffic calming circles, crosswalks with lights imbedded in the pavement, wildlife detection systems that flash when animals venture near roads, and variable speed limit signs.

Brian Walsh of the Washington State Department of Transportation was part of a group that hosted traffic experts from other countries who visited the State to see how it uses safety enhancements. Such networking opportunities are "essential in getting the knowledge we need to convince our own management of the benefits of a new technology or innovation," Walsh says.

A key way to improve highway safety is to treat the causes of crashes before they occur. U.S. safety experts traveled to Australia and New Zealand to study how those countries use road safety audits. Safety audits are a process that uses a team of experts to identify dangerous features of existing or future road projects.

After the scan, FHWA and the Institute of Transportation Engineers developed a seminar for State transportation departments interested in launching audit programs. About a dozen States have completed or signed up for the program. The engineers' group also established a Web site where States can access resources related to road safety audits.

Kentucky, one of the first States to participate in the road safety audit training program, put 140 highway professionals through the course. As part of their training, teams of experts from one highway district audited a construction project in another district, examining 12 projects in all for safety hazards.

"Basically, we're looking for potential crashes," says Joanne Tingle of the Kentucky Transportation Cabinet. "That's why we use multidisciplinary teams, so we can catch anything that could contribute to an accident. Our district people found that this process helps us make sure we have the safest product possible for Kentucky drivers. Safety is a priority for us, and this gets us closer to our goal."

Scanning for New Ideas

The International Technology Scanning Program is an ongoing process. While programs to test and implement ideas brought back from earlier scans are carried out, future scans are planned and organized. Some scans are designed to build on knowledge gained from what past teams observed and subsequent research on the topic, while others explore new areas of technology.

After observing the use of traffic circles in Europe, scan teams encouraged their construction in the United States to improve traffic flow at intersections.

FHWA and AASHTO share funding for the program, with AASHTO's funding provided through the Transportation Research Board's National Cooperative Highway Research Program. FHWA and AASHTO also work together to select scan topics. The two organizations solicit potential subjects, FHWA from its core business and service units, regional resource centers and field offices, and AASHTO through its committees. They evaluate each proposed scan on whether it will produce technologies or procedures that the U.S. transportation community can adopt and whether a scan is the best way to learn about those technologies.

A scan on recycled materials in highway construction in Europe led to a U.S. pilot project on the use of foam bitumen in recyled asphalt.

The organizations agree on no more than a dozen topics to explore over a two-year period. Among the topics upcoming teams plan to study are signalized intersection safety, winter operations management, asphalt pavement warranties, underground highway systems, environmental planning and design, and innovative technology for accelerated construction of bridge foundations.

After a scan topic wins approval, a team of about a dozen specialists in the area to be investigated is formed. FHWA and AASHTO each provide a co-chair. FHWA chooses additional team members from its ranks, while AASHTO selects participants from State transportation departments. Scan co-chairs work with FHWA and AASHTO to invite appropriate municipal, county or other public sector representatives to join the team. The co-chairs also contact private sector professional organizations and associations to invite representatives to join the team at their own expense.

The composition of the team is vital to the scan study's subsequent impact on technology adoption. Team members are selected not only for their expertise in the area being investigated, but for their ability to pass on what they have learned to the domestic transportation community and convince their peers to try new ideas. The goal is to provide hands-on knowledge of foreign technologies to leaders of public agencies and private industry. They, in turn, stimulate the introduction of the most promising innovations within their organizations and, ultimately, throughout the country.

Finding out more about what scan teams learn overseas is simple. Soon after they return, teams publish a summary of what they observed. They follow up with a comprehensive report, widely distributed among the transportation community, that includes details on their findings and recommendations.

Each team puts together a scan technology implementation plan that focuses on activities that will expose broad audiences of transportation experts to ideas gained from scans. Activities include briefings, workshops, articles, publications, Web postings, translations of foreign technical documents, and exhibits at major highway and transportation conferences. They also include research and demonstration programs around the country that explore how foreign technologies can best be adapted for American use.

Iowa DOT's Smithson is one of many scan participants who have shared what they learned overseas in presentations to professional colleagues. "When I showed slides I brought back from the winter road maintenance scan, I had 250 people in the audience saying, 'This looks great! How can we get going on this?' Scanning studies give us the ability to gain years of enthusiasm and experience and guidance on new technologies."

Free copies of all scanning study reports are available from FHWA's Office of International Programs, and all can be accessed at www.international.fhwa.dot.gov. Also available is FHWA's handbook, "International Guide to Transportation Information." It lists a variety of foreign and domestic information sources, including highway transportation libraries, research centers, databases, electronic bulletin boards, organizations, associations and professional societies.

For More Information

To learn more about the International Technology Scanning Program and how it benefits the U.S. traveling public, contact:

Office of International Programs
Federal Highway Administration
U.S. Department of Transportation
400 Seventh Street, SW
Washington, DC 20590
Phone: 202-366-9636
Fax: 202-366-9626
E-mail: international@fhwa.dot.gov
Web Site: www.international.fhwa.dot.gov

FHWA International Technology Exchange Reports

All reports are available online. Specially marked reports ( ) are available exclusively at www.international.fhwa.dot.gov.

Infrastructure

Geotechnical Engineering Practices in Canada and Europe
Geotechnology—Soil Nailing
International Contract Administration Techniques for Quality Enhancement-CATQEST

Pavements

European Asphalt Technology
European Concrete Technology
South African Pavement Technology
Highway / Commercial Vehicle Interaction
Recycled Materials in European Highway Environments

Bridges

Northumberland Strait Crossing Project
European Bridge Structures
Asian Bridge Structures
Bridge Maintenance Coatings
European Practices for Bridge Scour and Stream Instability Countermeasures
Advanced Composites in Bridges in Europe and Japan
Steel Bridge Fabrication Technologies in Europe and Japan

Planning and Environment

European Intermodal Programs: Planning, Policy and Technology
National Travel Surveys
Sustainable Transportation Practices in European Roads
Recycled Materials in European Highway Environments

Safety

Pedestrian and Bicycle Safety in England, Germany and the Netherlands
Speed Management and Enforcement Technology: Europe & Australia
Safety Management Practices in Japan, Australia, and New Zealand
Road Safety Audits—Final Report
Road Safety Audits—Case Studies
Innovative Traffic Control Technology & Practice in Europe
Commercial Vehicle Safety Technology & Practice in Europe
Methods and Procedures to Reduce Motorist Delays in European Work Zones

Operations

Advanced Transportation Technology
European Traffic Monitoring
European Road Lighting Technologies
Traffic Management and Traveler Information Systems
Winter Maintenance Technology and Practices - Learning from Abroad (1995)
European Winter Service Technology (1998)
Snowbreak Forest Book – Highway Snowstorm Countermeasure Manual
(*Translated from Japanese*)

Policy & Information

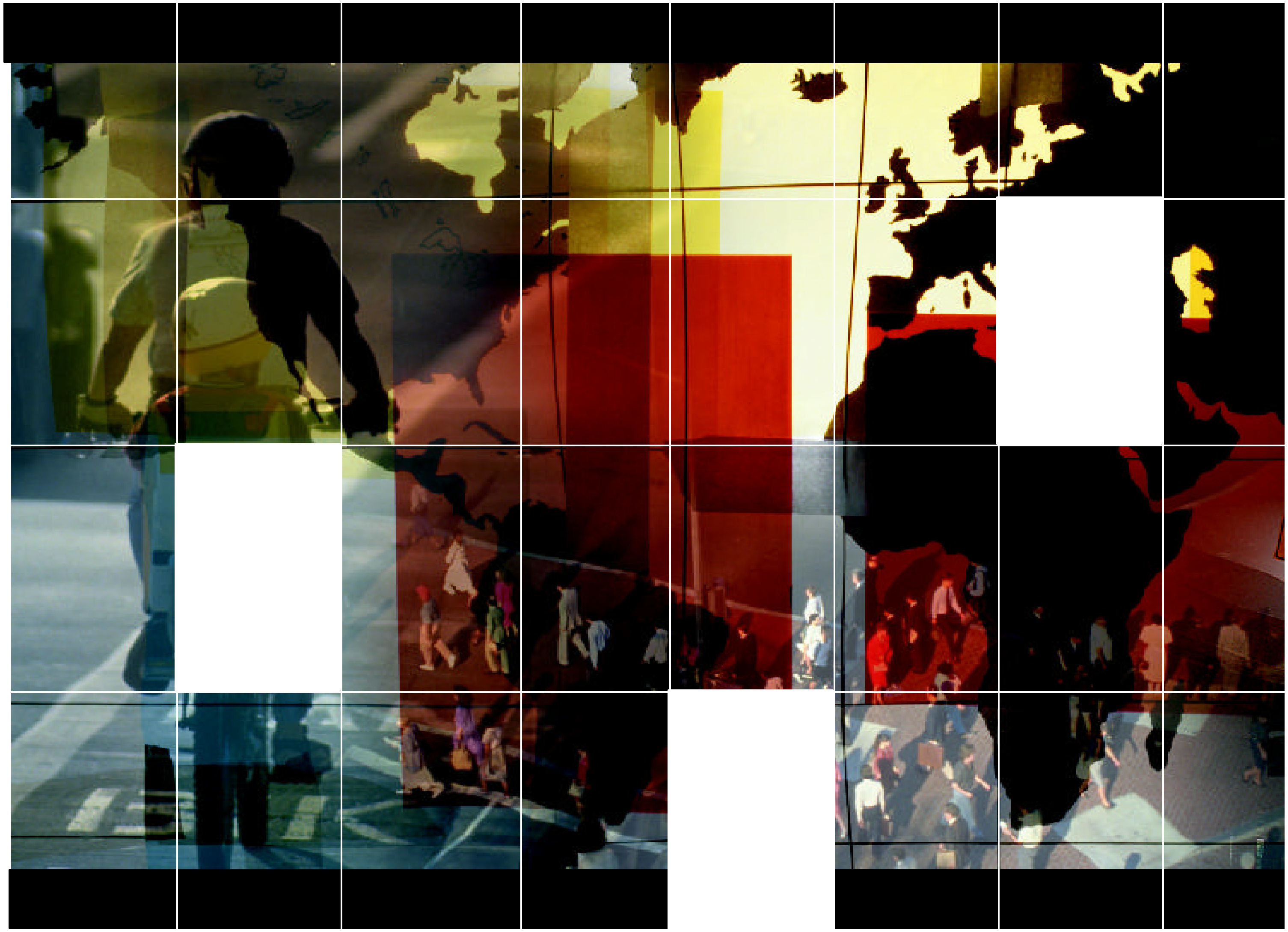
Emerging Models for Delivering Transportation Programs and Services
Acquiring Highway Transportation Information from Abroad—Handbook
Acquiring Highway Transportation Information from Abroad—Final Report
International Guide to Highway Transportation Information

Acknowledgements

The Federal Highway Administration and its partners, the American Association of State Highway Transportation Officials and the National Cooperative Highway Research Program, wish to thank the many people and organizations that have helped make the International Technology Scanning Program a success.

First, we would like to thank our gracious hosts and counterparts in the many countries that the scan teams have visited over the years. The hospitality and openness with which they have shared their insights, knowledge and information have had positive impacts on transportation systems in the United States, and have enhanced the professional development of transportation practitioners across the country.

Ultimately, though, the success of this program lies with the participation and commitment of forward- thinking transportation professionals from States, metropolitan planning organizations, municipal and county governments, and the private sector across the country. Their dedication to acquiring, disseminating, and implementing global innovations contributes to the continuous improvement of transportation in the United States.



Office of International Programs
FHWA/US DOT (HPIP)
400 Seventh Street, SW
Washington, DC 20590

202/366-9636
fax: 202/366-9626

international@fhwa.dot.gov
www.international.fhwa.dot.gov

Publication No.: FHWA-PL-02-002
HPIP-1-02(10M)EW