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Bridge Fabrication Systems: Bridges on the Move

"We wanted to see techniques for moving major elements of prefabricated bridges into service, something that ties our prefabricated designs with high-speed construction operations," says Prefabricated Bridge Elements and Systems Scan Co-Chair Mary Lou Ralls, state bridge engineer for the Texas Department of Transportation (DOT). "We saw what we came for, that's for sure."

In April 2004, an international scanning team representing the Federal Highway Administration (FHWA), state DOTs, universities, and industry traveled to Japan, the Netherlands, Belgium, Germany, and France. They visited active construction sites and captured some exciting move-in/move-out video footage for the rest of the country to see.

"With an aging bridge infrastructure and increasing traffic volumes, any innovation that promises to accommodate traffic quickly and safely will be considered," says Ralls, "and state bridge engineers will really look at what we found."

Scan Objective and Team Goals

The objectives of the scanning study were to identify innovative applications of prefabricated bridge elements and systems focusing on those factors that impact construction. They include minimizing traffic disruption, improving work zone safety, improving constructability, improving final product quality, minimizing environmental impact, and lowering life cycle costs.

"These were some pretty lofty objectives, but the technologies we saw met nearly all of them," says Ben Tang, scan co-chair and senior structural engineer at FHWA.

Skidding a bridge into position is one time-saving installation method used in Europe. (Photo courtesy Mammoet Corporation)

Move-In/Move-Out Innovations

The team observed some innovative techniques to remove existing bridges and bridge components and install new ones. The principle involves building the new bridge near the existing structure, quickly removing the old bridge or

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embankment, and moving the new bridge into its final location.

"We have moved a couple of U.S. bridges this way, but have literally thousands of future candidates," says Harry Capers, state bridge engineer for the New Jersey DOT. "In western Europe, they average a bridge roll-in once a week using these innovative techniques."

The countries the scan team visited presented many projects that were accomplished in 48-to-72-hour windows for different sizes of bridges. In Europe, the technology actually is a crossover, transferred from the seaport freight-handling industry.

Self-Propelled Modular Transporters

In Europe, large bridge components, even complete bridges weighing several thousand metric tons, have been built at one location and then lifted and transported to their final location. The technique employs a series of vehicles known as self-propelled modular transporters (SPMTs). These multi-axle, computer-controlled vehicles are capable of moving in any horizontal direction with equal axle loads without distorting the bridge geometry.

Two companies do most of the movement work in Europe and are establishing bases in the United States. They both urge a systems approach, not just a construction approach.

"You need to consider these techniques early in the design phase, not wait until construction," says scan reporter and consultant Henry Russell. "The bridges are uniquely designed for movement, and the transport companies will only participate if they are brought in early to integrate the design with the movement. Bridge engineers really need to get construction personnel involved as early as possible in the design phase."

Large bridge components are moved into place with self-propelled modular transporters, or SPMTs. (Photos courtesy Mammoet Corporation and Sarens Group)

Other Bridge Installation Systems

In addition to SPMTs, the team identified other methods countries are using to move bridge components. They include skidding or sliding bridges into place horizontally, launching bridges longitudinally across valleys or above existing highways, floating bridges into place using barges or a temporary dry dock, building bridges alongside an existing roadway and rotating them into place, and lifting bridges vertically. All of these systems have resulted in installation times between 3 and 48 hours.

The Benefits

The benefit of using these techniques is that construction can take place in an environment where operations are completely separated from the traveling public.

"These techniques clearly reduce traffic disruption from months to days or hours, improve work zone safety, minimize environmental impact, improve product quality, improve constructability, and lower life cycle costs," says Dan Dorgan, state bridge engineer for the Minnesota DOT.

"The controlled environment for both building the new structure and dismantling the old are both off the critical path of your typical bridge project. We really want to see this as a standard option in the United States within the next 10 years."

Bridge Components

The team also looked at other aspects of the bridge fabrication process that have promise in the United States.

Full-Depth Prefabricated Concrete Decks

The use of full-depth prefabricated concrete decks in Japan and France reduces construction time by eliminating deck formwork. The deck panels are connected to steel beams by studs located in pockets in the concrete deck slab. The benefits include higher quality, faster construction, less traffic impact, and greater workforce safety.

Deck Joint Closure Details

Prefabricated deck systems require that joints be provided to make the deck continuous to distribute the traffic load and resist seismic movements. The team discovered special loop bar reinforcement details in the joints that will be evaluated for use in the United States to facilitate the use of prefabricated full-depth deck systems.

Superstructure Systems

"Our typical sequence of erecting bridge superstructures in the United States is to erect the concrete or steel beams, place either temporary formwork or stay-in-place formwork such as steel or concrete panels, place deck reinforcement, cast deck concrete, and remove formwork if necessary," notes William Nickas, state structures design engineer for the Florida DOT. "Elimination of formwork for the deck after the beams are erected can accelerate on-site construction and improve safety. Two systems we saw really satisfied this objective."

Poutre Dalle System

One method to eliminate formwork and provide a working surface is provided by the French Poutre Dalle system. In this system, shallow, inverted tee-beams are placed adjacent to each other. They are then made composite with cast-in-place concrete placed between the webs of the tees and over the tops of the stems to form a solid member.

Partial-Depth Concrete Decks

Another system from Germany involved casting partial-depth concrete decks on steel or concrete beams before erecting the beams. After the beams are erected, the edges of each deck unit abut the adjacent member, eliminating the need to place additional formwork for the cast-in-place concrete.

This process speeds construction and reduces the potential danger of equipment falling onto the roadway below, since a safe working surface is available immediately after beam erection.

To reduce the weight of precast concrete segments, the Japanese use a segment in which the traditional top slab is replaced with a transverse prestressed concrete rib. After the segments are erected, precast, prestressed concrete panels are placed longitudinally between the transverse ribs. After a topping is cast on top of the panels, the deck is post-tensioned transversely.

Substructure Systems

The team also observed a number of substructure systems that have potential application in the United States. One is the SPER system, a Japanese method of rapid construction of bridge piers using stay-in-place, precast concrete panels as both structural elements and formwork for cast-in-place concrete. Short, solid piers have panels for outer formwork, while tall, hollow piers have panels for both the inner and outer formwork.

Segments are stacked on top of each other using epoxy joints, and filled with cast-in-place concrete to form a composite section. Research in Japan has demonstrated that these piers have seismic performance similar to conventional cast-in-place reinforced concrete piers. The system has the advantage of reduced construction time and results in a high-quality, durable external finish.

The French Poutre Dalle sytem eliminates the need for formwork in bridge construction.

Japan's SPER system for rapid construction of bridge piers uses precast concrete panels as structural elements and formwork. (Photo courtesy Sumitomo Mitsui Construction Co.)

SCAN FACTOIDS

Did you know?

- More than 675 public- and private-sector professionals have been involved in nearly 60 scans since 1990 and have visited 27 countries.
- Six Federal agencies, 43 DOTs and 35 associations have sent representatives.
- The most visited country is Germany, followed by the United Kingdom and the Netherlands.

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Implementation Activities

The scan team has already started many implementation activities. They include numerous written papers and technical presentations at national and local meetings and conferences on the overall results of the scanning study and details on specific technologies.

The team has also prepared a comprehensive Scanning Technology Implementation Plan for these and other technologies it observed. The strategies involve obtaining more technical details on technologies from the host countries, seeking demonstration or pilot projects for the move-in/move-out technologies, and holding many workshops and seminars to get the word out on the technologies that have potential for U.S. use. Several research statements have been developed to establish design details.

The Future

"We have made great inroads in the United States on prefabrication over the last five years or so," says Ralls. "With the new techniques we found, the construction of prefabricated bridges will be faster and of higher quality. And this, I am sure, will please the motoring public."

For the latest information on bridge prefabrication systems and techniques, visit www.fhwa.dot.gov/bridge/prefab/index.htm.

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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

Around the World

November 24-26, 2004
1st European Road Congress
Lisbon, Portugal
www.europeanroadcongress.com/

January 9-13, 2004
Transportation Research Board 84th Annual Meeting
Washington, DC
www.trb.org/meeting/

February 9-19, 2005
Road Safety & Traffic Management 2005
Intercontinental Hotel
Cairo, Egypt
www.i-ep.com/en/index.asp

May 22–25, 2005
National Roundabout Conference
Vail, Colorado
www.trb.org/Conferences/Roundabout

June 14-18, 2005
15th International Road Federation (IRF) World Meeting/Exhibition
Bangkok, Thailand
www.irf2005.com

March 27–30, 2006
XII International Winter Road Congress
Torino–Sestriere (Italia)
www.aipcr2006.it

September 16-22, 2007
PIARC World Congress
Paris, France
www.piarc.org

For copies of all international scan reports, visit http://international.fhwa.dot.gov/ and click on publications.

Quiet Pavement Systems:

Attacking Road Noise at its Source

In cities, suburbs, and even many rural areas across America, residents can step out of their homes just about any time of the day or night and hear the unmistakable hum of highway noise.

"Highway noise is probably the most significant noise impact that we have in our lives," says Robert Bernhard, co-director of the Institute for Safe, Quiet and Durable Highways and mechanical engineering professor at Purdue University.

Bernhard was part of a team of experts that participated in a May 2004 scanning study—sponsored by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO)—to investigate how European highway agencies use quiet pavement systems to limit roadway noise.

"The Europeans have been working on this problem for many years, so we were hoping to identify some new directions for our noise mitigation programs in the United States," Bernhard says.

"Highway noise is a growing problem in states like California," says Randell Iwasaki, scan co-chair and interim director of the California Department of Transportation (Caltrans).

U.S. highway agencies have relied mainly on sound walls to mitigate highway noise over the years, Iwasaki says, but they can cost more than $1 million a mile to build. Since Caltrans erected its first one in 1968, the agency has spent more than $500 million on sound walls.

In addition to being expensive, sound walls can have limited noise benefits, often to less than 400 meters from the roadway.

Multifaceted Approach

"The Europeans use a multifaceted approach to dealing with noise," says Iwasaki. That approach includes such tactics as designing housing developments so that backyards don't face noisy roadways, and developing quiet pavements to mitigate noise at the source.

The scanning team learned that reducing highway noise has been a critical issue in Europe for more than two decades. All of the countries the team visited—Denmark, France, Italy, the Netherlands, and the United Kingdom—have policies requiring consideration of quiet pavement where noise is expected to be a concern.

In addition, a noise directive adopted by the European Union (EU) requires member countries to develop environmental noise maps identifying critical areas and create action plans for reducing noise by 2007. Under its Harmonoise project, the EU is developing a highway noise prediction model that will incorporate pavement type, along with other parameters such as meteorological effects.

The scanning team found that the Europeans are focusing on three major quiet pavement technologies: thin-surfaced, negatively textured gap-graded asphalt mixes; single- and double-layer highly porous asphalt mixes; and exposed aggregate concrete mixes.

The emerging trend, the team observed, is to use thin-surfaced gap-graded mixes with small aggregate in urban areas and areas subject to significant snow and ice accumulations.

More porous gap-graded asphalt surfaces are used on rural and high-speed roadways with moderate winter conditions. Exposed aggregate concrete is used where concrete pavement surfacing is allowed.

Building Quiet Pavements

The scanning team learned that no special construction equipment or training is required to build the quiet pavement systems used in Europe, although the underlying structure of the roadway must be sound before any of the systems are applied.

"The quiet pavement technologies used in Europe are not that much different than the standard pavement technologies in the United States," Bernhard says.

Reducing vehicle spray and improving skid resistance were the main reasons porous surfaces were first used in the countries the team visited, but noise reduction proved to be a side benefit to efforts to produce safer pavement for wet weather conditions.

The Europeans find maintenance a challenge on some quiet pavements. They use pre-wetted salt to fight formation of black ice on highly porous

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Double Porous Asphalt Pavement Netherlands Roads to the Future

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Reducing highway noise is a key issue in Europe, where new quiet pavement technologies are being developed to address the problem at the source.

Scan Benefit Snapshot

Stone Matrix Asphalt.

Considered by many as the premium asphalt pavement surface, stone matrix asphalt (SMA) was introduced in the United States in 1991 after the very first scan. Since then, more than 10 million tons have been used on U.S. roadways. In 12 short years, national research, implementation, standard setting, conferences, mix procedures, and training courses all have been put into place. The Maryland DOT reports nearly doubling the time between maintenance cycles on Interstate 495 Beltway projects for a product that is within 10 percent of the normal product price. The National Center for Asphalt Technology calculated that with just a 25 percent increase in the life of a pavement surface, SMA would save more than $50 million annually.

pavements, which can increase winter maintenance costs as much as 50 percent. Some countries have switched to stone matrix asphalt pavement with small aggregate in icy and snowy regions.

In addition to what the Europeans have put into practice, the team discovered an extensive amount of research on quiet pavement technology underway in Europe. "We were impressed by how much research effort they are putting into this problem," says Bernhard.

Much of the research involves partnerships between government and industry. For the Netherlands' Roads to the Future program, for example, the government invited contractors to develop innovative concepts for tomorrow's road surface and chose several for demonstration projects. They include a prefabricated, noise-reducing pavement that can be rolled out like carpeting.

"Projects like the rollable road are simply amazing," says Iwasaki. "The government looked out 20 years and challenged industry to see if it could meet that vision today."

Proposals for U.S. Use

Based on what it observed during the scan, the team developed short- and long-term recommendations on quiet pavement systems that could be beneficial in the United States. Among their short-term proposals are the following:

- **Evaluate the use of double-layer porous asphalt mixes to reduce noise on high-speed roadways.** Porous mixes should not be placed in urban areas where traffic speeds drop below 45 miles per hour, the team notes, since they tend to clog in slower traffic.
- **Consider reducing the size of the aggregate used in mixes applied to the wearing surface.** Quiet surfacing mixes used in Europe have aggregate sizes ranging from 4 to 10 millimeters, while most highway agencies in the United States use aggregate gradations of 9.5 to 19 millimeters.

  "In California, we're looking at using smaller aggregate sizes in our wearing surfaces to reduce noise," says Iwasaki. "We're concerned about the durability of the surface using smaller aggregate, so we're looking at that also."
- **Try thin-textured surfacing using a small aggregate in urban and other areas with lower traffic speeds.** To achieve noise reduction, the team recommends that the texture should be negative, because pavements with positive textures, such as chip seals, increase noise.
- **Investigate the role of diamond grinding—a process used to smooth concrete surfaces—in reducing pavement noise.** Caltrans, for example, is working with the grooving and grinding industry to come up with better grinding specifications for noise reduction, according to Iwasaki.
- **Put together a team of acoustical experts and pavement engineers to develop AASHTO protocols for measuring the acoustical performance of quiet pavements.** "That way, when we're building a roadway or doing rehabilitation, we can factor in the noise component as well as safety, durability, and other factors," says Iwasaki.

To Learn More

The team is working on an implementation plan for carrying out its recommendations.

Meanwhile, Iwasaki encourages highway professionals dealing with road noise issues to contact the team to learn more. "It's a diverse team representing academia, industry, and state and federal agencies—all working together to find ways to build roadways quieter," he says.

For information on the scan, contact the co-chairs: David Gibbs, (801) 963–0182, david.gibbs@fhwa.dot.gov; and Randell Iwasaki, (916) 654–6130, randell_iwasaki@dot.ca.gov.

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Construction Management Practices:

Rethinking Effective Highway Project Delivery

Highway agencies and their industry partners are rethinking the basic ways highway construction projects are designed and delivered in the United States, according to a scan team looking at alternative construction management practices.

Traditional U.S. practices—such as low-bid and unit-price contracting—have served the public well in construction of the country's highway systems, the team says in a report on its May 2004 scan of international practices.

But U.S. practices tend to diminish trust between agencies and contractors and inhibit efficiency and innovation. In some cases, they contribute to cost and schedule overruns.

"Projects are much more complex than they were even 10 years ago and public expectations are greater," says Steven DeWitt, scan co-chair and director of construction for the North Carolina Department of Transportation (DOT).

To learn about alternatives other countries are using, the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) sponsored the 10-member team's scanning study of Europe and Canada.

"We went over to see what kinds of management practices and ideas they've developed that we could use in the United States to better manage our programs and produce better quality, more cost-effective products," says Tucker Ferguson, scan team member and chief of the Pennsylvania DOT Contract Management Division.

Finding the Best Value

The team observed that, just as in the United States, highway agencies in Europe and Canada face the challenge of operating an aging infrastructure under tight funding constraints, growing environmental challenges, and leaner staffs.

The international agencies are developing innovative solutions to this challenge. While the low-bid system common in the United States is used abroad, most of the countries the team visited have adopted a best-value procurement system as standard procedure.

In addition to price, best-value methods base procurement decisions on factors such as team qualifications, past performance, and design alternatives. The Ministry of Transportation in Ontario, Canada, for example, developed a Registry Appraisal and Quality System to rate contractors on past performance.

Procurements based solely on qualifications—not price—are also used. England's Highways Agency developed a Capability Assessment Toolkit to help the agency in qualification-based selection of designers and contractors for major projects.

An overriding objective of these procurement systems, the team found, is to create trust and long-term partnerships between agencies and industry. "We saw a lot of evidence of teamwork, of contractors and agencies working together to reach a common goal," says Ferguson.

Another contrast the scan team observed is in contract payment methods. While unit pricing based on

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quantities produced is the most-used method in the United States, other countries are having success with lump-sum payments. The Scottish Executive, for example, makes payments when project milestones are completed to minimize its administrative burdens and give contractors incentives to work efficiently.

"From a state agency perspective, it's a better process because we don't have the task of measuring quantities and tracking hundreds of pay items," says DeWitt. "We've tried it here in North Carolina, and I see us heading more in that direction in the coming years."

In most of the countries the scan team visited, highway agencies with trimmed-down staffs have turned to the private sector to perform functions they used to do themselves, such as design, construction management, and maintenance. Agency focus has shifted from contract compliance for individual services to network management through integrated service contracts.

"They do more long-term operate-and-maintain types of contracts, in which they turn over a section of a highway to a contractor to design, build, and maintain for 20 or 30 years," says Ferguson. "That's something we don't generally do in the United States."

The agencies also use risk analysis and allocation techniques to help them quantify project risk and choose contracting strategies to mitigate those risks. In England, the Highways Agency Risk Management tool helps officials select the most effective contracting methods early in the project life cycle. In the Netherlands, Public Sector Comparator and the Public-Private Comparator tools help the Ministry of Transport make the same decisions.

Ideas for Innovations

Based on its observations in Europe and Canada, the scanning team

The Scottish Executive is using a design, build, finance, and operate contract to build the M77 Motorway project southwest of Glasgow, Scotland.

Fast-tracking Construction Management Implementation

"You know, it would really be great if we could include international experiences on best value contracting in the current NCHRP 10-61 Best Value Procurement Project," said Steve Dewitt, NCDOT and Co-Chair of the Construction Management Scan. "We learned so much about how the European countries align project goals and customer objectives with measurable evaluation criteria, setting a framework for project success."

A call to NCHRP's Project Manager Tim Hess, his quick polling of the panel, the selling of the idea, the allocating of funds and, well, it was done. "This was just the right time, as we were about to close out the project. This will add a lot to the overall value of the project," said Hess.

The scope of work involves collecting evaluation plans from international agencies involved in the scan, analyzing the data for application to the NCHRP 10-61 best value framework, and producing a revised final report. This will leverage both the Construction Management Scan findings and the original NCHRP research by incorporating significant international experience into this evolving procurement method in the U.S.

European highway agencies are developing innovative ways to deliver construction jobs, such as the Aubing tunnel project on Highway A99 near Munich, Germany.

developed recommendations on construction management practices agencies in the United States should consider trying. They include the following:

- Develop procurement and construction management methods that better align the goals of the customers, owner, and contractors.
- Devise more effective processes for determining risks and assigning them to the party best able to manage them.
- Evolve from a traditional one-size-fits-all project delivery method, and strategically apply alternative methods that promote early industry involvement and life cycle design solutions.
- Create consistent rating processes to facilitate quality-based selection of contractors.
- Use alternative payment methods such as milestone and lump-sum payments to promote efficiency.
- Consider long-term warranties on critical components of projects to produce better products and allow for more innovation.

The recommendations "offer a challenge to highway construction professionals to change the current construction management practices that create adversarial relationships," according to the team's scan report. "We must develop new practices that promote trust, create teamwork, and align all participants towards customer-focused objectives of quality, safety, and dependable transportation risks."

The team's plan for implementing its recommendations includes conducting pilot studies to test their feasibility in the United States. "One I'd like to try in Pennsylvania is expanding the use of pavement warranty specifications," says Ferguson. "We've done a few for asphalt, but we're looking at doing more and expanding them to concrete."

Adapting to U.S. Needs

The implementation plan also calls for making presentations on the team's findings and recommendations at conferences and workshops, and getting feedback from highway construction professionals in the public and private sectors.

"This is a culture change for the United States," says Ferguson. "It's a new way of doing business. We in government need to work with industry to show the benefits for us and the contractors."

The goal is to take the best of European and Canadian construction management practices and mold processes that will work in a different U.S. environment, says DeWitt. The United States has many more contractors than Europe, for example, and many of them are small businesses.

"Small contractors built America—the interstate highway system and the farm-to-market roads—and helped make it what it is today," he says. "We don't want to create a system that shuts them out. They're important to our history and our future. We have to be careful to not take the European model and throw it into the middle of the United States."

For a summary of the scan, visit http://construction.colorado.edu. For more information on the scan, contact the co-chairs: Gerald Yakowenko, (202) 366–1562, gerald.yakowenko@fhwa.dot.gov. Steven DeWitt, (919) 715–4458, sdewitt@dot.state.nc.us.

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Note: affiliations were current as of the time of the scanning tour

PIARC/AIPCR— World Road Association

Exchanging a World of Transportation Knowledge

By Martine Micozzi, NCHRP Senior Program Officer

You may have heard the terms "PIARC" or "AIPCR" mentioned before and wondered whether they were one in the same. This quick primer is designed to provide a better understanding of PIARC/AIPCR and U.S. transportation officials' involvement in it.

PIARC/AIPCR: The "French" Connection

What is the connection between PIARC and AIPCR? These acronyms describe a single international organization in two languages. In French, the acronym "AIPCR" stands for the "Association Mondiale de la Route." Its English acronym, PIARC, translates as: "The World Road Association." This international association based in Paris, France, was established in 1909 as a nonpolitical, and nonprofit association. As of September 2004, PIARC member countries included 108 national governments from around the world. Approximately two-thirds of the member countries are developing countries and countries in transition. There are approximately 2000 other members (about half of which are individual members) from nearly 130 countries. The three official languages of the association are French, English, and Spanish.

PIARC's vision is to be the world leader in the exchange of knowledge on roads and transport policy and practices within an integrated, sustainable context. The association's goals are to provide universal, quality service in an open, objective, and impartial way. Moreover, PIARC seeks to promote sustainable and sound economic solutions; recognize road transport in an integrated transport and land use context; be customer driven; and respect differing international road transport needs.

To achieve this vision, PIARC creates and coordinates technical committees, organizes a quadrennial World Road Congress and Winter Road Congress, offers various technical seminars, and publishes a large number of documents, including a quarterly magazine, *Routes/Roads*.

As a PIARC member, the U.S. is represented by delegates from the U.S. Department of Transportation's (USDOT), Federal Highway Administration (FHWA), and state DOTs who serve on technical committees. Under NCHRP 20-36, funds are provided to support state DOT delegates' travel to attend PIARC Committee meetings while FHWA funds USDOT delegates' travel.

James Wright, Minnesota DOT C16 Committee, Network Operations

This has been an extraordinary learning experience. The experience provided opportunities to see what other countries are doing in operations, what policies are driving their programs, and a first-hand experience actually seeing specific transportation operations. It has had an impact on my thinking in transportation, an impact on how I see government and business working together, and a greater appreciation of what we have in the United States.

Every four years, PIARC sponsors two types of congresses: the World Road Congress and the International Winter Road Congress. Both Congresses meet in a member country to enable members to share techniques and experiences in the field of road infrastructures and road transport. The next World Road Congress (XXIIIrd) will be held in Paris, France, in September 17-21, 2007, celebrating the association's 100th anniversary.

As a complement to the World Road Congresses, PIARC also organizes an international congress dedicated to winter road maintenance. The Italian cities of Turin and Sestriere will host the next International Winter Road Congress scheduled for March 27-30, 2006.

Strategic Themes and Technical Committees

PIARC operates on a four-year cycle with a strategic plan comprised of up to four theme areas. Each cycle concludes with an international conference showcasing the key accomplishments and findings of its technical committees. The most recent PIARC World Congress was held in 2003 in Durban, South Africa. The new strategic plan for 2004-2007 sets the organizational structure and the terms of reference for all technical committees. The technical work of PIARC is divided into four strategic themes of governance, outputs, operations, and inputs. Under these themes, 18 technical committees work on various subjects in the transportation field.

These technical committees, consisting of distinguished engineers and transportation experts appointed by member countries, are tasked with producing reports, and conducting seminars in developing countries and countries in transition on best practices and recommendations in their respective fields.

Strategic Theme 1—Governance and Management of the Road System

Strategic Theme 1 investigates the necessary measures to improve the governance and management of the road administration in the provision of road systems in accordance with international best practices.

This includes road system economics, effects of road pricing, effective and efficient management measures, and new ideas for network-wide management operations with an emphasis on customers in the provision of services, and appropriate use of intelligent transportation systems (ITS) technology for an integrated transport system.

The four technical committees under this theme include Road System Economics, Financing Road System Investment, Performance of Road Administrations, and Management of Network Operations.

Strategic Theme 2—Sustained Mobility

The scope of work for Strategic Theme 2 unites the themes of sustainability and integration of different transport modes in urban and rural areas in developed and developing countries and those in transition. Particular attention is paid to extreme situations in mega cities and isolated rural communities.

A growing concern is balancing the demands of environmental management and development pressures to achieve sustainable and beneficial community outcomes, taking into account mobility needs and the economic imperative of moving goods efficiently and effectively.

Technical committees under this theme include Sustainable Development and Road Transport, Urban Areas and Integrated Urban Transport, Rural Roads and Accessibility, and Freight Transport and Intermodality.

PIARC 2004-2007 Program

PIARC Committee	U.S. Delegate
1.1 Road System Economics	Jim March, FHWA
1.2 Financing Road System Investment	Sherri Alston, FHWA
1.3 Performance of Road Administrations	Randy Halvorson, MN DOT
1.4 Management of Infrastructure Assets	Wayne Berman, FHWA
2.1 Sustainable Development and Road Transport	Gloria Shepard, FHWA
2.2 Interurban Roads and Integrated Interurban Transport	Ysela Llort, FL DOT
2.3 Urban Areas and Integrated Urban Transport	Raj Ghaman, FHWA
2.4 Freight Transport and Intermodality	Gloria Jeff, MI DOT
2.5 Rural Transport Needs	Norm Roush, WV DOT
3.3 Road Tunnel Operations	Tony Caserta, FHWA
3.1 Road Safety	Beth Alicandri, FHWA
3.4 Winter Maintenance	Patrick Hughes, MN DOT
	Paul Pisano, FHWA
4.1 Management of Road Infrastructure Assets	Timothy J. Gilchrist, NY DOT
4.2 Road/Vehicle Interaction	Mark Swanlund, FHWA
4.3 Road Pavements	Monte Symons, FHWA
4.4 Road Bridges and Related Structures	Mal Kerley, VA DOT

Strategic Theme 3—Safety and Road Operations

The goal of Strategic Theme 3 is to improve the safe and efficient use of the road system, including the movement of people and goods on the road network, while efficiently managing the risks associated with road transport operations and the natural environment. The emphasis is on improvements to safety assessments, mechanisms, designs, and procedures consistent with efficient and effective operations that meet customer and user expectations, with particular emphasis on information systems and information sharing. Technical committees under this theme include Road Safety, Road Tunnel Operations, Winter Maintenance, and Risk Management for Roads.

Strategic Theme 4—Quality of Road Infrastructure

Theme 4 focuses on providing an efficient management of road assets. This requires implementing management systems capable of integrating all components of infrastructure, based on indicators reflecting functionalities and taking into account the expectations of the users and residents.

Under this theme, approaches to work design and techniques that increase the durability of infrastructure elements are reviewed. Emphasis is placed on reviewing progress made in maintenance techniques that can reduce the nuisance to users and residents, and the impact on the environment.

Technical committees under this theme include Management of Road Infrastructure Assets, Road/Vehicle Interaction, Road Pavement, and Road Bridges, Related Structures, and Earthworks, Drainage and Subgrade.

Projects and Events

From its inception, PIARC's commitment to technology transfer has been the foundation of its philosophy and

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mission. That commitment has evolved from information sharing between developed industrialized countries to include developing countries and nations in transition.

At the 1987 World Road Congress in Brussels, PIARC passed a resolution affirming commitment to technology transfer. The 1995 and 1999 congresses in Montreal and Kuala Lumpur reaffirmed those goals in the PIARC strategic plan. Projects in support of this commitment have since been launched, including Technology Transfer Centers; seminars by technical committees; HDM-4, a software system for investigating choices in investing in roads and road transport information; and the Special Fund, designed to facilitate participation of developing countries in PIARC activities.

World Interchange Network

A popular PIARC program is the World Interchange Network (WIN). It was created in 1995 to connect people with questions about road technology and transport with experts who can provide the information they need.

WIN is not intended as a source of free engineering services, but rather as a means of transferring readily available knowledge between countries. The main beneficiaries are expected to be developing countries and countries in transition, but WIN will also be valuable to developed countries for establishing and enhancing contacts with other road organizations.

PIARC plans to establish a WIN contact person in each member country. The information provided on the WIN Web site may be viewed by anyone. PIARC members have the extra benefit of being able to email a request for information via an online form.

Call for Scan Proposals—2006-2007 Cycle

FHWA and AASHTO are accepting scan proposals for the Fiscal Year 2006-2007 cycle of the Joint AASHTO/FHWA International Technology Scanning Program.

How to Submit Ideas

FHWA Scan proposals may be submitted by FHWA program offices and Resource Centers with appropriate endorsements from the various program officers and associate administrators. Cross-cutting scans should be endorsed by all appropriate offices. Contact Hana Maier, FHWA's Office of International Programs at (202) 366–0111 or hana.maier@fhwa.dot.gov for more information.

AASHTO Scan proposals may be submitted by any AASHTO committee or subcommittee dealing with road transportation with appropriate endorsements by the relevant committee or subcommittee chairman. Again, cross-cutting scan should be endorsed by all appropriate offices. Contact Cameron Kergaye at (202) 624-7826 or ckergaye@aashto.org for more information.

NCHRP Project Panel 20-36. Other non-AASHTO or FHWA scan proposals (such as those from transportation industry associations or academia) may be submitted to NCHRP Project Panel 20-36. Project Panel 20-36 will evaluate such proposals and forward promising ones to the relevant AASHTO committee for consideration in making scan proposals. Contact Martine Micozzi, NCHRP's Senior Program Manager at (202) 334–3972 or mmicozzi@nas.edu.

Due Date:

The deadline for submitting scan proposals is March 15, 2005.

TranScan

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