



U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION

OPERATIONS

Forum Seeks Fresh Solutions for Foul Weather

In 2001, more than 6,900 people lost their lives on roadways in adverse weather in the United States. In addition, nearly 470,000 injuries result from weather-related crashes annually. Weather events can cause a routine traffic delay to deteriorate quickly from bad to worse.

In November 2003, the American Meteorological Society and the Federal Highway Administration (FHWA) cosponsored a policy forum in Washington, DC, to discuss how to improve the safety and operation of the Nation's highway system through enhanced transportation management strategies based on better application of weather information. With the theme "Weather and Highways," the 2-day event attracted weather researchers, transportation managers, and specialists representing academia, the private sector, and Federal, State, and local agencies.

FHWA Associate Administrator for Operations Jeffrey F. Paniati, also the acting director of the Intelligent Transportation System (ITS) Joint Program Office, shared FHWA's perspective on research needs and barriers. Paniati explained that managing the highway system involves transportation professionals representing many areas of specialization. The Road Weather Management Program at FHWA documented 44 types of highway managers who use weather informa-

tion to make 423 different kinds of decisions. This diversity complicates how weather information is packaged. In addition, the differing missions and requirements between and within agencies translate into a lack of uniformity in the application of weather information.

The Road Weather Management Program supports a dual mission of making the meteorological community aware of specific road weather information needs, while educating the highway management community about new tools and techniques. The Maintenance Decision Support System project, for example, uses state-of-the-art weather forecasting technologies and computerized maintenance rules of practice to create an automated system that generates an optimized set of recommendations for winter road maintenance. The program's goal is a system that provides "anytime, anywhere, road weather information" for highway users and managers alike.

Paniati also emphasized that new applications to manage weather on roadways need to keep pace with the evolving strategies for operating the Nation's highways. In the past, highway agencies focused on building new roads, but today FHWA is helping reshape the way highways operate by addressing operations-related problems. Paniati highlighted six characteristics that FHWA believes



Variable message signs, like the one shown above, can alert drivers about congestion during adverse weather events, such as snowstorms, by providing real-time information.

can transform an organization into a "21st century operations agency." First, agencies must be focused on the customer by responding to the needs of residents, tourists, workers, businesses, and freight operators, who care about the quality and reliability of their trips regardless of who "owns" the roadway. Second, agencies need to improve the performance of the transportation system in terms of road capacity, cost savings,

(Continued on page 7)

INFRASTRUCTURE

FHWA Publications Spread the Word on New Geotechnical Applications

Each year, researchers develop many new products, materials, and standards for geotechnical engineering, such as rapid-testing methods, faster and more powerful installation equipment, and improved techniques for site characterization. Staying on top of the latest developments can be challenging for specialists in highway design and construction, but many of these new technologies can help maximize scarce resources and improve the quality of the Nation's transportation system.

To keep transportation professionals up-to-date, the Federal Highway Administration's (FHWA) National Geotechnical Team is developing a series of reports offering practical geotechnical design and construction guidance. Known as the Geotechnical Engineering Circulars (GECs), the publications focus on emerging

and underutilized technologies within the transportation industry. To date, FHWA has produced seven GECs, including two new reports in 2003.

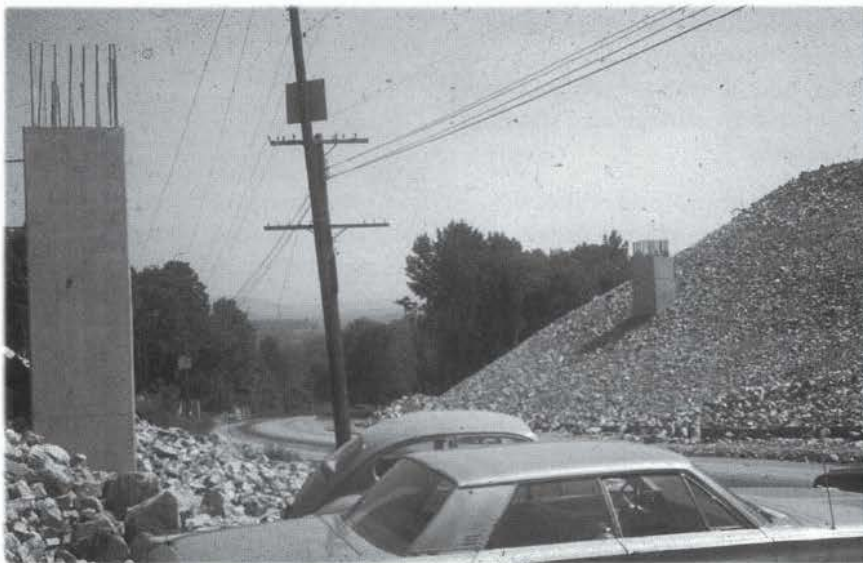
GEC #6, "Shallow Foundations" (FHWA-IF-02-054), highlights techniques and guidance for designing and constructing shallow foundations, such as simple footings under retaining walls or more elaborate bridge piers or abutments that only extend several feet below the bottom of a highway structure. As a relatively new technology, shallow foundations are underutilized in the transportation industry. They have the potential, however, to reduce costs and improve infrastructure performance in situations where installing deep foundations, such as driven and drilled piles, is expensive or environmentally

unattractive. In addition, at many urban interchanges, constructing shallow foundations may be faster and less disruptive than other alternatives. The report includes requirements for using specific materials and highlights information on placing shallow foundations to minimize or eliminate post-construction deformations.

GEC #7, "Soil Nail Walls" (FHWA-IF-03-017), explains the technique of using steel bars to reinforce earthen walls. Installation involves sequentially excavating soil or rock and inserting unstressed, grouted soil nails. Transportation agencies can use soil nailing for excavation applications like slope stabilization and the construction of temporary and permanent retaining walls and abutments. The technique has a design life of 75 years, requires minimal workspace, and can save money and reduce construction time. The report also provides guidance and best practices for applying the technique and cautions designers to use performance-based rather than traditional specifications for projects involving soil nailing.

The target audience for the GEC series includes managers, engineers, and researchers responsible for selecting, designing, constructing, and contracting geotechnical engineering features for transportation projects. To download or request a copy of any of the reports, visit www.fhwa.dot.gov/bridge/geopub.htm#geotechcirculars.

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Piers in end fills such as the one shown above can be subject to tilting if the settlement is not correctly accounted for. Applying current design and construction procedures for shallow foundations can minimize such problems.

OPERATIONS

New Web Feature Spreads the Good Word on ITS

Transportation professionals around the Nation are using intelligent transportation systems (ITS) to help improve traffic safety, reduce congestion, increase nighttime vision, and keep drivers awake. Using the latest computers, electronics, communications, and safety systems, these professionals are applying ITS technologies to highways, streets, bridges, and vehicles. With numerous ITS technologies already available and many more in development, however, transportation professionals want a quick and easy way to learn about the experiences of others who are using the technologies, the costs and benefits of ITS, and whether the available technologies meet industry expectations. With this information, transportation professionals will be better equipped to choose the right ITS technologies for their projects and spend scarce transportation resources wisely.

To highlight some of the most successful ITS technologies, the U.S. Department of Transportation's ITS Joint Program Office recently introduced the ITS Benefit of the Month, a new feature available on the office's "ITS Benefits and Costs Database" Web site. Each ITS Benefit of the Month entry indicates how ITS helped transportation professionals improve safety, mobility, efficiency, productivity, or the environment of a community.

The November 2003 entry, for example, showcased the success of adaptive signal control systems, which adjust the timing of traffic signals based on traffic flow. After the systems were deployed at inter-

sections in Los Angeles, CA, overall intersection delay decreased by up to 18 percent, and the level-of-service—a qualitative measure of how well an intersection is operating based on traffic volume and geometric conditions—improved at most intersections by up to 55 percent. More than 2,500 of the 4,000 traffic signals in Los Angeles, CA, currently are equipped with adaptive signal controls.

These kinds of signal controls were found to be most beneficial at two-phase intersections with exclusive turning lanes and/or unbalanced critical volumes—intersections where traffic on the cross street is significantly greater than on the main street at particular times of day. The benefit was considerably less at intersections with multiple phases, such as advanced green lights for left turns, because such intersections require a minimum time for each phase of the signal. This type of timing leaves little flexibility for adjusting the green phase according to traffic flow.

More recently, the December 2003 ITS Benefit of the Month entry highlighted TravInfo®, a traveler information system used in the San Francisco Bay area. TravInfo provides the public with travel updates via telephone—by dialing 511—and the Internet. To evaluate TravInfo, researchers at the University of California, with funding from the Federal Highway Administration and the California Department of Transportation, conducted a field operational test from 1996 to 1998. Although researchers found that only 9 percent of households were aware of

TravInfo, the test results indicated that users of TravInfo's telephone and Internet services were two to three times more likely to change their travel plans, such as their routes or departure times, than those who relied on traffic reports broadcast on radio or television.

The test showed that the Internet travel advisory service had the greatest influence on travelers' plans. The information presented online influenced 81 percent of Web site visitors. The phone service was the second most effective medium, with 45 percent of callers changing their travel plans compared with only 25 percent who heard reports on radio or television. These results suggest that graphic displays and verbal descriptions of freeway traffic speeds and incident locations enabled travelers in the San Francisco Bay Area to select different departure times and choose alternate routes.

The ITS Joint Program Office distributes the Benefit of the Month via e-mail to ITS media outlets monthly and posts it on the "ITS Benefits and Costs Database" Web site at www.benefitcost.its.dot.gov. The Web site also provides access to a growing collection of information on the benefits and costs of implemented ITS technologies, including summaries of ITS benefits and unit costs, conference papers, and other reports.

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(Continued from page 1)

customer satisfaction, delay, energy and the environment, and safety. Third, agencies need to shift to a systems approach, which means adopting a regional view of managing highways that transcends city, county, and State boundaries and system ownership.

Next, agencies increasingly need to focus on managing highways in real time by providing up-to-date

information on weather, pavement conditions, incidents, traffic flow, maintenance activities, and construction plans. Fifth, since the transportation system functions 24 hours a day and 7 days a week, operations agencies need to conduct some functions on a 24/7 basis to be responsive to their customers. Finally, highway agencies need to improve their ability to anticipate and manage transporta-

tion events, whether caused by construction, incidents, or weather.

A final report summarizing the recommendations from the forum will be available in spring 2004. For more information on managing road weather, visit <http://ops.fhwa.dot.gov/weather>.

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TECHNOLOGY INNOVATION

FHWA Deploys New Tunnel Management System

As tunnel components such as fans, pumps, and structural supports reach the end of their service lives, deferred or neglected maintenance can speed their deterioration and result in costly repairs or necessitate complete replacement. To help improve the Nation's highways, tunnels, and underground transit infrastructure, the Federal Highway Administration (FHWA) developed the Tunnel Management System (TMS), and has made it available for downloading at <http://assetmanagement.transportation.org>.

The system includes guidance for inspecting, maintaining, and repairing structural elements of tunnels and mechanical and electrical components. It also includes a software program for tunnel operators to use to create a database for collecting and

analyzing information about specific facilities. Data can include ratings for the condition of components; sketches, photos, and videos of defects; comments describing conditions; and a log of completed repairs and repair costs.

Unlike previously developed systems, the new TMS includes best practices from sources around the country and is available on the Internet. Because the system is comprehensive and can be downloaded, the U.S. Department of Transportation now is able to disseminate information on tunnel management nationally.

"We can't simply design and build tunnels and expect them to care for themselves," says Associate Administrator for Infrastructure King W. Gee. "Because TMS will be available to all highway agencies, owners, and operators, it will become an invaluable tool in maintaining and preserving our Nation's tunnel assets."

The system outlines the protocol for tunnel inspections and record keeping, and includes two downloadable manuals. The *Highway and Rail Transit Tunnel Inspection Manual* (Contract No. DTFH61-01-C-00067) describes tunnel components and

provides guidelines for performing inspections and recording their results, while the *Highway and Rail Transit Tunnel Maintenance and Rehabilitation Manual* (Contract No. DTFH61-01-C-00067) provides recommendations on best practices for preventative maintenance and structural repairs on various tunnel components.

FHWA recently combined forces with the District of Columbia Department of Transportation (DDOT) to deploy the first TMS for highway tunnels. Coordinated by FHWA's Office of Asset Management, the deployment includes installation of the TMS software onto the DDOT server, populating the system with an inventory of tunnels in Washington, DC, and using the software program and guidance manuals to collect inspection data on the structural features and other components of the tunnels. DDOT began collecting inspection data in September 2003 and will continue through January 2004. When the project is complete, the agencies will post a report on the Internet documenting the deployment of the TMS.

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FHWA's new Tunnel Management System will help agencies manage tunnels such as the one shown above.