



## INFRASTRUCTURE

### Geophysics Helps Solve Highway-Related Problems

The use of geophysics for various highway-related applications has numerous benefits over traditional approaches, such as borings, sampling, or other destructive techniques, which can be expensive, time-consuming, and sometimes ineffective. Geophysical methods—such as applying seismic vibrations to take images of the soil-bedrock interface or to locate underground voids and utilities, or applying ground-penetrating radar for identifying deterioration zones in aging bridges—enable engineers to collect large numbers of data points rapidly, economically, nondestructively, and with minimal traffic disruption and safety risks. Despite the benefits, many transportation engineers opt not to use geophysical methods because the engineers lack experience with these techniques.

To assist engineers responsible for geotechnical or structural investigations at State departments of transportation, the Federal Highway Administration (FHWA) recently developed a Web-based manual that describes commonly used geophysical methods and their principal applications. Entitled *Application of Geophysical Methods to Highway Related Problems*, the manual will provide highway engineers with a basic knowledge of the state-of-the-practice for geophysical and nondestructive

testing and evaluation methods.

The manual is divided into two parts. The first is problem-oriented and describes several geophysical imaging and nondestructive testing methods, including ultraseismic profiling and magnetic field disturbance (MFD).

Engineers can employ ultraseismic profiling, for example, to evaluate the length of both shallow and deep foundations. MFD is a direct-measurement technique that engineers can use to detect flaws in steel, and, in particular, rebar. MFD can detect fractures and corrosion of reinforcing strands in concrete and in-filled plastic and metal ducts in concrete. Other topics in the manual's first part include subsurface characterizations, vibration measurements, and techniques to evaluate bridge substructures and superstructures.

The second part of the manual features a more comprehensive discussion of geophysical techniques and theory to provide conceptual information on the methodology, using equations only when necessary. This section is designed for individuals who may



The advantage of using ground-penetrating radar systems, such as the one shown here, is the ability to collect continuous data at posted highway speeds. FHWA's new publication, *Application of Geophysical Methods to Highway Related Problems*, describes these systems and other geophysical methods.

not be familiar with geophysics but require a deeper understanding of these methods without excessive technical language and mathematics. Highlights include explanations of the physical properties of ground materials, geophysical relationships, and definitions of the units of measurement used in geophysics.

Although geophysical technologies do not eliminate the need for conventional characterization methods, they may help expedite the investigative process, reduce costs, and improve the reliability of the final product. To download the manual, visit [www.fhwa.gov/geotechnical](http://www.fhwa.gov/geotechnical) or contact:

Khamis Y. Haramy  
720-963-3521  
[khamis.haramy@fhwa.dot.gov](mailto:khamis.haramy@fhwa.dot.gov)

## RESEARCH & TECHNOLOGY TRANSPORTER

The *Research and Technology Transporter* communicates FHWA research, development, and technology accomplishments, findings, information, and technology transfer opportunities. Its audience is transportation engineers and professionals in State and local highway agencies, State DOTs, Local Technical Assistance Program centers, Divisions, Resource Center, academia, and the research community. The eight-page newsletter is published monthly by FHWA's Office of Research, Development, and Technology. Editorial offices are housed at the Turner-Fairbank Highway Research Center. Comments should be sent to the managing editor at the address below. Field offices are encouraged to submit articles for publication via the appropriate agency technology leader from the editorial board listed below. The newsletter can be viewed online at [www.tfhrc.gov](http://www.tfhrc.gov). Subscriptions to the *Transporter* are free. Send your request to Martha Soneira at the address below, or send an e-mail to [martha.soneira@fhwa.dot.gov](mailto:martha.soneira@fhwa.dot.gov).

**Norman Y. Mineta**  
Secretary  
U.S. Department of Transportation

**Mary E. Peters**  
Administrator  
Federal Highway Administration

**Frederick G. Wright**  
Executive Director  
Federal Highway Administration

### Editorial Board

C. Burbank; K. Gee;  
A. Hamilton; C. Johnson;  
D. Judycki; G. Ostensen;  
M. Vecchiatti

Managing Editor, Martha Soneira  
Editor, Keri A. Funderburg  
Design, Don Jones  
Distribution, Martha Soneira



U.S. Department of Transportation  
Federal Highway Administration  
Turner-Fairbank Highway Research Center  
6300 Georgetown Pike, HRTS  
McLean, VA 22101-2296  
[www.tfhrc.gov](http://www.tfhrc.gov)

## INFORMATION RESOURCES

### Library Conference Highlights Knowledge Management

Information professionals—including librarians, chief information officers, and Web developers—use various technologies to develop, deploy, and manage information resources and services to advance the missions of their respective organizations, whether government, corporate, or academic. Keeping up to date on technological developments, therefore, enables them to offer the best possible service to their organizations.

Thousands of information professionals from around the world—including several representing the U.S. Department of Transportation, Federal Highway Administration (FHWA), and other transportation organizations—met in June 2004 in Nashville, TN, for the annual conference of the Special Libraries Association. Highlighted by the theme, "Putting Knowledge to Work," the conference included numerous sessions, workshops, and exhibits showcasing more than 300 innovative information products and technologies. Attendees from the transportation industry participated in a transportation division program led by Shaun Moran, library manager for Transport Canada.

The program included a session with the Government Transportation Research Information Committee (GTRIC) chaired by Nelda Bravo, director of the National Transportation Library. GTRIC provides an information forum for government research libraries and focuses on partnering among those entities. Through the forum, public and private sector libraries from the United States and Canada come together to work on strengthening information access. At the conference, the GTRIC session featured a discussion by Sandra Tucker,

manager of library and information services at the Texas Transportation Institute on managing an online thesaurus; an update by Nina McLawhorn, research administrator at the Wisconsin Department of Transportation (DOT) on the reauthorization of surface transportation legislation; and a presentation by FHWA's Martha Soneira, strategic communications team leader, on innovative approaches to filling information gaps at the agency; and other presentations and discussions.

Soneira's presentation focused on efforts to upgrade the Technical Reference Center (TRC) at FHWA's Turner-Fairbank Highway Research Center (TFHRC) in McLean, VA. Working with the National Transportation Library (NTL), TFHRC will be able to secure the services of the Minnesota DOT library to improve services at the TRC. Soneira explained that TFHRC has been working diligently to offer FHWA researchers and engineers an interlibrary loan service, reference support, improved access to electronic databases, an organized collection of highway research and technology information, and comfortable reading and study areas at the TRC. Representatives from NTL and TFHRC currently are cataloging the TRC collection of approximately 45,000 highway research, technology, and training titles for Web access.

For more information on the conference, visit [www.sla.org/nashville2004/index2.htm](http://www.sla.org/nashville2004/index2.htm). For more information about the Special Libraries Association, go to [www.sla.org](http://www.sla.org).

**Zachary Ellis**  
202-493-3193  
[zac.ellis@fhwa.dot.gov](mailto:zac.ellis@fhwa.dot.gov)

## OUTREACH

# A New FHWA Exhibit Helps Move Innovation into Practice

Transportation professionals and agencies need to know about new technologies and products in a timely way. Federal Highway Administration (FHWA) researchers are developing new technological innovations continuously, and information about these technologies must be transferred to transportation professionals and agencies in an effective manner.

For many years, FHWA has used exhibit displays as an easy-to-

understand, cost-effective, and highly visible method of transferring information about new highway technologies and innovations to the transportation community. Past experience has proven that these attractive and informative exhibits and their accompanying materials are an excellent vehicle for disseminating significant amounts of information to target audiences at technical conferences, trade shows, workshops, seminars, and other gather-

ings. FHWA scientists, engineers, program directors, marketing specialists, and executives can benefit from using displays to convey their messages.

The agency recently created a new exhibit entitled *Moving Technology and Innovation into Practice*, developed as a result of FHWA's *Corporate Master Plan for Research and Deployment of Technology & Innovation* published in 2003. The new exhibit consists of a retractable banner measuring 1.2 by 2.1 meters (4 by 7 feet), supplemental handouts, and wire publication racks. The handouts

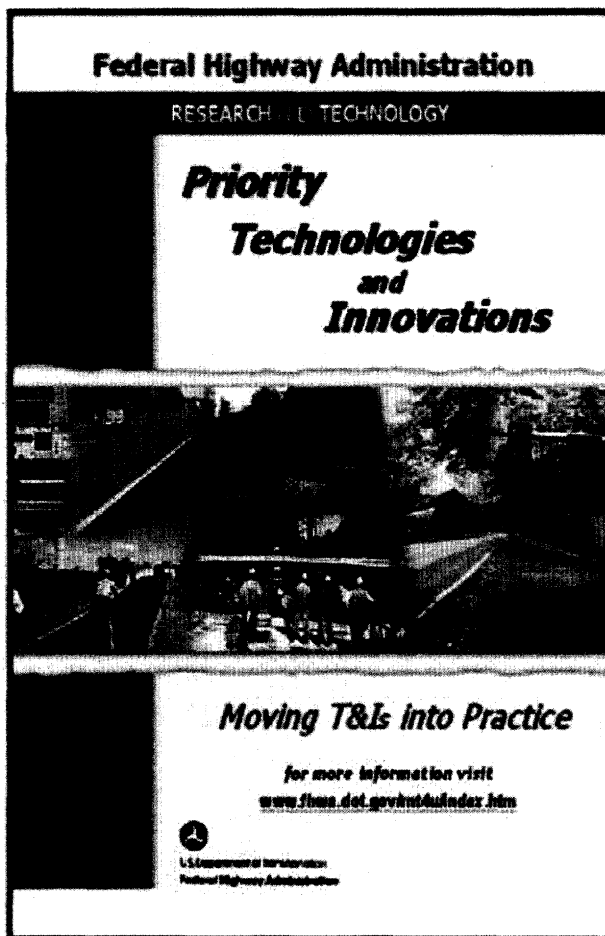
include one-page technical information sheets on the latest priority, market-ready technologies and innovations (T&I's) that FHWA recommends for deployment. One handout, for example, describes Border Wizard—a software model that accurately simulates all cross-border movements of cars, buses, trucks, and pedestrians using customs, immigration, and security procedures. Another handout discusses QuickZone—a user-friendly computer software tool for estimating and analyzing the length of queues and delays in work zones. A comprehensive list of the available T&I's can be viewed and downloaded from [www.fhwa.dot.gov/rmt4u/pti.htm](http://www.fhwa.dot.gov/rmt4u/pti.htm).

In addition to the new exhibit, FHWA currently has more than 100 existing displays covering dozens of topics, ranging from software programming to management strategies for transportation professionals. To obtain more information on available displays, view photographs of the displays, or order a display, visit [www.fhwa.dot.gov/mris/exhibit/assistance.htm](http://www.fhwa.dot.gov/mris/exhibit/assistance.htm). To borrow the new T&I display or any of the other displays shown online, contact:

**Kevin Connor**  
202-493-3187  
[kevin.connor@fhwa.dot.gov](mailto:kevin.connor@fhwa.dot.gov)

To discuss and select appropriate T&I handouts for an upcoming meeting, contact:

**Joe Conway**  
202-493-3186  
[joe.conway@fhwa.dot.gov](mailto:joe.conway@fhwa.dot.gov)



The banner from FHWA's new exhibit, *Moving Technology and Innovation into Practice*, is shown above.

### New Guide Helps Engineers Manage Construction

The Federal Highway Administration's (FHWA) division offices are responsible for the stewardship of the Federal-aid highway program—a program that distributes Federal funds to States for the construction and improvement of the highway system. A critical part of this responsibility is the management of highway construction projects and oversight of final construction work. Completed projects are the end product of the Federal-aid highway program and are what the public uses to measure the success of the States and FHWA in meeting their stewardship responsibilities.

In recent years, however, FHWA, like many government agencies, has faced a declining workforce. At the same time, the size of the Federal-aid highway program has increased, along with the number and complexity of highway projects and congestion and construction-related traffic delays. As a result, division offices must manage and allocate their staff time and resources between the many oversight activities required under the Federal-aid program, including construction. These resource allocation decisions are based on risk assessments designed to ensure that the agency is delivering programs in an efficient and effective manner.

To help the division offices maximize the use of their time and resources, FHWA's Construction Quality Improvement Team recently developed the *Construction Program Management and Inspection Guide* (FHWA-04-013). This guide is a comprehensive source of infor-

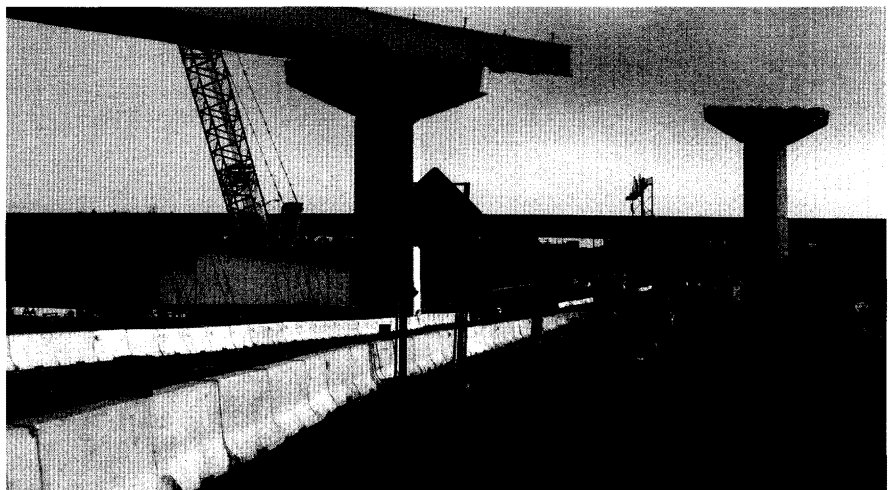
mation on how to oversee construction effectively and prepare to meet the needs of the future Federal-aid highway program. The guide provides an overview of the changing role of FHWA's field staff and an understanding of construction program management, with an emphasis on construction inspection techniques at the program and project levels.

The guide highlights the technical elements that should be integrated into inspections at various stages of construction, such as ensuring that appropriate procedures are followed for grading, traffic control, and worker safety. These elements help engineers provide a reasonable level of quality assurance. The guide also includes various forms that staff can use during construction inspections, an outline of the various types of inspections, and information on the benefits and uses of different inspections.

To prepare employees to meet future challenges, such as those posed by the growth in highway construction and technological and operational advances, the guide includes information on new and innovative construction practices and construction technician certification and training. To supplement the guide, FHWA is developing a training workshop on construction program management, which will be designed for FHWA field engineers, although others are encouraged to attend. The workshop is scheduled to be delivered in fall 2004.

For more information on the workshop, contact Jeff Lewis at 916-498-5035 or [jeff.lewis@fhwa.dot.gov](mailto:jeff.lewis@fhwa.dot.gov). For more information on the guide, contact:

**Ken Jacoby**  
202-366-6503  
[ken.jacoby@fhwa.dot.gov](mailto:ken.jacoby@fhwa.dot.gov)



The Federal Highway Administration's division offices oversee final construction work on highways, such as the project shown above to improve a highway interchange in Springfield, VA. FHWA's new *Construction Program Management and Inspection Guide* serves as a comprehensive source of information for division offices on how to oversee this type of construction effectively.

## SAFETY/OPERATIONS

# Caltrans Demonstrates New Mobile Work Zone Protection Device

Protecting the safety of construction and maintenance field crews and motorists on roadways is the top priority of the California Department of Transportation (Caltrans) and the Federal Highway Administration (FHWA). More than 40,000 people are injured each year as a result of motor vehicle crashes in work zones. In addition, fatalities from work zone crashes have increased more than 50 percent in the last 5 years.

To increase the safety of field workers and motorists at highway projects and to enhance the efficiency of those projects, Caltrans, with support from FHWA, has created a mobile work zone protection device known as the Balsi Beam. Named for a Caltrans worker injured in a work zone crash, the Balsi Beam is an innovative, patent-pending device that serves as an extendable physical barrier to protect the flank of a work zone.

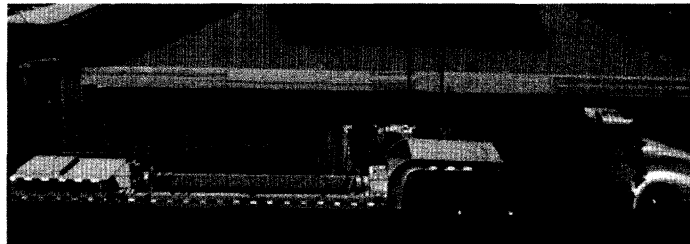
Construction crews can transport the modified protection device by tractor-trailer to a worksite and set it up in approximately 5 minutes. Each side of the trailer consists of high-strength steel box section beams that can extend an additional 4.6 meters (15 feet). Using hydraulic power, each beam can rotate to the left or right depending on where protection is needed. The trailer then extends to provide a 9.1-meter (30-foot) secure work zone. The trailer beams act as a rigid obstacle that deflects errant traffic away from workers. Crews can use the device in various types of work zones, including those on

road shoulders adjacent to guardrails and sound walls.

In June 2004, Caltrans—in cooperation with the FHWA Resource Center and FHWA's Office of Infrastructure—embarked on a 6,400-kilometer (4,000-mile) road show to

demonstrate the device. Representatives from Caltrans hitched the Balsi Beam to the back of a truck and, starting in Sacramento, CA, traveled through five States before reaching their destination, a meeting of the American Association of State Highway and Transportation Officials' (AASHTO) Highway Subcommittee on Maintenance, in Bismarck, ND.

At the meeting, Caltrans demonstrated the Balsi Beam, along with several exhibitors demonstrating other safety and maintenance devices and techniques. On the return trip, the Caltrans team stopped in South Dakota, Nebraska, Wyoming, Colorado, Utah, and Nevada. At each stop, Caltrans and FHWA demonstrated the barrier for local police and employees of State departments of transportation and FHWA division offices, to obtain feedback. The device so far has



Caltrans' Balsi Beam work zone protection device is shown here attached to a tractor truck.



The Balsi Beam, deployed here in a work zone, provides an enclosed safety zone for construction.

received overwhelmingly positive reviews for its user-friendliness, ease of operation, and potential to save lives.

Caltrans currently owns and maintains the only Balsi Beam. After gathering enough feedback to determine where and how the beam can be used most effectively, Caltrans and FHWA will collaborate with other State agencies to design and implement similar work zone protection devices.

*Jerry Jones*  
817-978-4358  
[jerry.jones@fhwa.dot.gov](mailto:jerry.jones@fhwa.dot.gov)

*Sri Balasubramanian, California DOT*  
916-227-9600  
[balasubramanian@dot.ca.gov](mailto:balasubramanian@dot.ca.gov)

*Kris Teague, California DOT*  
916-227-9608  
[kris.teague@dot.ca.gov](mailto:kris.teague@dot.ca.gov)

California DOT

California DOT

## TECHNOLOGY INNOVATION

# WASHTO-X Videoconference Promotes Market-Ready Technologies

**T**ransportation researchers develop many technologies that can save lives, money, and time on the Nation's highways, but those innovations can benefit the traveling public only when highway agencies put them into practice. With so many innovations available, agencies may find it challenging to identify and deploy the technologies with the greatest potential for success, especially if the agency lacks previous experience with a particular technology.

To help highway agencies put the most promising innovations into everyday practice, the Federal Highway Administration (FHWA) has developed a list of 26 priority, market-ready technologies and innovations. The list is an outcome of FHWA's *Corporate Master Plan for Research and Deployment of Technology & Innovation*, the agency's vision for future research and technology efforts. In July 2004, staff from FHWA outlined the priority list and provided details on several technologies in a videoconference that it cosponsored with several State departments of transportation (DOTs) belonging to the Western Association of State Highway and Transportation Officials (WASHTO).

During the videoconference, FHWA staff described the criteria for inclusion on the priority list, such as supporting FHWA's goals of enhancing safety, reducing congestion, and improving the environment. The technologies on the list also fill a demonstrated need in the Nation's highway system and are ready for the market. Fact sheets describing the

benefits of each technology, where it has been used, and resources available to assist with implementation are available at [www.fhwa.dot.gov/rnt4u/pti.htm](http://www.fhwa.dot.gov/rnt4u/pti.htm).

The videoconference included a presentation on the safety technologies currently featured on the priority list, and FHWA staff discussed roundabouts, rumble strips, and red light cameras. Roundabouts—circular intersections that require entering vehicles to yield to existing traffic in the roadway—eliminate some of the conflict traffic, such as vehicles making left turns, that can cause crashes at traditional intersections. A study by the Maryland State Highway Administration found that installing single-lane roundabouts at 15 intersections resulted in a 100 percent decrease in the fatal crash rate and an 82 percent drop in the total crash rate. For more information on roundabouts, FHWA has developed a handbook for highway agencies, *Roundabouts: An Informational Guide* (FHWA-RD-00-067), which can be downloaded from [www.tfhrc.gov/safety/00068.htm](http://www.tfhrc.gov/safety/00068.htm).

Rumble strips—grooved indentations in the roadway that provide an audible warning and a physical vibration to alert drivers in danger of veering off the road—help reduce roadway departure crashes, which accounted for 55 percent of all roadway fatalities in 2001. A study found that installing rumble strips on the New York State Thruway reduced run-off-the-road crashes by 88 percent from between 1993 and 1997. Rumble strips are inexpensive, can be milled in new or existing pavement, and require little maintenance. An FHWA technical advisory, *Roadway Shoulder Rumble Strips*, is available at [www.fhwa.dot.gov/legsregs/directives/techadv/t504035.htm](http://www.fhwa.dot.gov/legsregs/directives/techadv/t504035.htm).

Many jurisdictions use red light cameras, which photograph vehicles passing over pavement sensors after a traffic signal has turned red, to automate enforcement of driving laws and reduce intersection crashes, which account for more than 40 percent of all crashes. To help transportation officials identify and address safety problems



**Rumble strips like these are one of FHWA's 26 priority, market-ready technologies and innovations, and can help reduce roadway departure crashes, which account for more than half of all roadway fatalities.**

resulting from red light running, FHWA and the National Highway Traffic Safety Administration have published *Guidance for Using Red Light Cameras* (FHWA-SA-03-018), available at <http://safety.fhwa.dot.gov/rlcguide/>.

Another presentation discussed the Traffic Signal Operations Self Assessment. The National Transportation Operations Coalition—in partnership with FHWA—developed the Self Assessment to assist transportation agencies responsible for the continuous operation and maintenance of traffic signals. The Self Assessment will help agencies understand opportunities for improving their traffic signal policies and practices. Using input from key staff responsible for operating traffic signals, the self-scored assessment takes approximately 1-hour to complete. The Self Assessment is available on the Institute of Transportation Engineers' (ITE) Web site at [www.ite.org/selfassessment](http://www.ite.org/selfassessment).

Other presentations at the videoconference described computer-based tools available to help highway agencies analyze transportation needs. The software SpecWizard™, for example, can help agencies write specifications for purchasing intelligent transportation systems (ITS) based on the National Transportation Communications for ITS Protocol (NTCIP) standards. ITS equipment produced using these standards offers greater levels of interoperability and interchangeability than equipment not based on the standards.

Another tool, called Border Wizard, is a computer model that simulates cross-border movements of vehicles and pedestrians. It can simulate all Federal inspection activities at land-based border stations to determine infrastructure, facility, and staff needs. More than 60 U.S. ports of

entry have used Border Wizard to evaluate existing or prospective facilities and to save on capital investments. Several State highway agencies also are looking at using Border Wizard as a transportation planning tool.

The videoconference was one in a series sponsored by the WASHTO-X program, a technology transfer initiative subsidized under the FHWA Transportation Pooled Fund (TPF) Program. The program enables State DOTs and FHWA to combine resources for transportation research and technology projects. The goal of the WASHTO-X program is to provide low-cost opportunities for transportation professionals to conduct information exchanges and discussions on technical, policy, and procedural topics through videoconferencing.

Sponsors of the WASHTO-X program include highway agencies in Arizona, California, Nevada, Oklahoma, Oregon, Utah, and Washington. In addition, several other State DOTs have participated in WASHTO-X events along with technical experts

from the FHWA Resource Center and headquarters office.

Several WASHTO-X videoconferences are scheduled for fall 2004:

- Project Delivery Performance Measures & Outsourcing—September 14, 2004
- Dealing with Utilities in Projects—September 28, 2004
- Developments in Winter Maintenance & Outsourcing—October 12, 2004
- New Product Evaluation—October 26, 2004
- Dealing with Biohazards in Maintenance Operations—November 9, 2004
- Pavement Performance Monitoring & Design—November 23, 2004

To learn more about WASHTO-X, visit [www.washto-x.org/index.php](http://www.washto-x.org/index.php).

*Joe Conway*  
202-493-3186  
[joe.conway@fhwa.dot.gov](mailto:joe.conway@fhwa.dot.gov)



Photos courtesy of Kansas State University Center for Transportation Research & Training

**Research shows that well-designed roundabouts such as this one can be safer and more efficient than conventional intersections.**



**The installation of 15 roundabouts in Maryland, including this one on Route 17, resulted in a 60 percent decrease in the total crash rate for those intersections.**



U.S. Department of Transportation  
**Federal Highway Administration**

Research, Development, and Technology  
6300 Georgetown Pike  
McLean, VA 22101-2296

Official Business  
Penalty for Private Use \$300

HRTS

FIRST CLASS  
POSTAGE & FEES PAID  
FEDERAL HIGHWAY  
ADMINISTRATION  
PERMIT NO. G-66

---

## TRAINING

---

### **New Course Turns Technical Experts into Technical Instructors**

---

**B**uzzwords and phrases such as budget cuts, attrition, and downsizing are surfacing with increasing frequency in many State departments of transportation. Under these conditions, agency employees may be forced to take on new roles or tasks that require additional training. To help these employees, many State agencies provide technical training in a diverse group of subject areas, ranging from designing concrete mixes to improving work zone safety. Because finding one individual with the expertise to teach in all areas would be difficult, technicians frequently are recruited from their normal positions to become instructors. These technicians are experts in their fields, but they may lack experience in how to facilitate a training session.

To address this need, the Federal Highway Administration (FHWA) created the Transportation Curriculum Coordination Council (TC3)—a group funded by a multi-state pooled fund, linked to FHWA

through the Office of Infrastructure Research and Development, and supported by the National Highway Institute (NHI). TC3 works with regional and State transportation agencies, and other organizations to help them fulfill training requirements.

One of TC3's latest efforts is development of a course for transportation professionals who conduct technical training. TC3 partnered with NHI to develop the 2.5-day Instructor Development for Technicians Course. During the course, participants will become competent instructors by learning communication and presentation skills based on adult learner expectations. Participants will watch demonstrations of the proper methods for teaching a group of new technicians about laboratory test procedures. After the demonstrations, course participants will conduct practice training presentations and view videotapes of the presentations to help improve their skills. They also will learn to administer proficiency exams

to students who require individual assessments or testing upon course completion to receive State credit or qualifications.

Although NHI helped develop the course materials and will make them available for free, it will not directly offer the course. Anyone interested in offering the course can use the course materials and an instructor from their own organization, or they can contract with a professional trainer. The course is still under development, but NHI and TC3 are planning a pilot class in fall 2004, with widespread distribution shortly thereafter. For more information, contact Chris Anderson, team leader, at [christie.anderson@dot.iowa.gov](mailto:christie.anderson@dot.iowa.gov), or John Taylor, NHI training program manager, at [john.taylor@fhwa.dot.gov](mailto:john.taylor@fhwa.dot.gov). For more information on TC3, contact Chris Newman, program manager, at [christopher.newman@fhwa.dot.gov](mailto:christopher.newman@fhwa.dot.gov).

*Nancy Stout*  
703-235-1260  
[nancy.stout@fhwa.dot.gov](mailto:nancy.stout@fhwa.dot.gov)