RESEARCH & TECHNOLOGY
TRANSPORTER

FEBRUARY 2005

U.S. DEPARTMENT OF TRANSPORTATION | FEDERAL HIGHWAY ADMINISTRATION

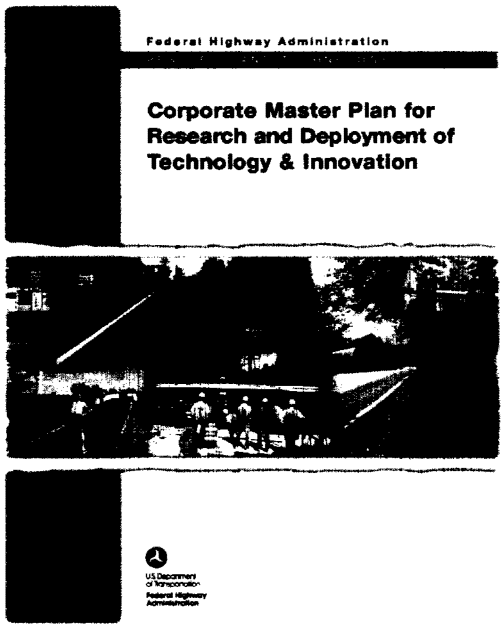
PRIORITY TECHNOLOGIES AND INNOVATIONS

FHWA Makes Progress on Initiatives in Corporate Master Plan

The Federal Highway Administration (FHWA) works closely with partners and stakeholders to bring the newest highway research and technology to the Nation's roads. FHWA-sponsored research has yielded a number of innovations that improve the highway system, such as longer lasting pavements and advanced traffic control systems. Over the next 20 years, experts predict that the U.S. population will increase by 45 million, while the number of vehicle miles traveled is expected to grow twice as fast. Concerns about congestion, roadway safety, land use, and protection of the environment are driving the search for new approaches to meet future transportation infrastructure needs.

FHWA realizes the need to raise the bar for delivery of the agency's national research and technology (R&T) program to address the daunting highway transportation challenges facing the Nation. The *Corporate Master Plan for Research and Deployment of Technology & Innovation* (FHWA-RD-03-077) is a corporate strategy, developed in 2003, to help the agency do the right research, do it well, and get the products into the hands of the people who then are responsible for delivering the best highway transportation system possible.

The corporate master plan identifies seven guiding principles, such as engaging stakeholders in the R&T process and grounding research in FHWA's mission and goals, and 26 supporting commitments to further the agency's role as a national leader. Since 2003, FHWA has made strides toward implementing these principles and meeting these commitments.



FHWA's *Corporate Master Plan for Research and Deployment of Technology & Innovation.*

Established in 2004, FHWA's Office of Corporate Research and Technology, led by Debra Elston, works in constant partnership with internal and external stakeholders to help the agency's leadership advance the commitments listed in the corporate master plan. The new office is assisting with the continually evolving multiyear roadmaps for more than 60 functional R&T areas. The multiyear roadmaps facilitate program management and encompass transportation planning and decisionmaking, environmental stewardship, operations, congestion mitigation, safety, pavements, and structures. The roadmaps address policy and programmatic stewardship responsibilities as well. The office also is developing executive-level roadmaps to synthesize the functional R&T area roadmaps to improve external communications of FHWA's R&T program.

In addition to these activities, by the end of 2005, FHWA will conduct a pilot merit review of functional programs focusing on the R&T investment criteria of relevance, performance, and quality.

Highway stakeholders also are looking to FHWA to increase the agency's advanced research efforts. FHWA accepted the challenge to

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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. 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.

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SAFETY

Conference Held on the Highway Safety Information System

Informed transportation decision-making requires an understanding of how safety is affected by factors such as the geometric design of roadways, the selection and placement of roadside hardware, the use of traffic control measures, and the needs and abilities of highway users. To provide a central location for data on these factors, the Federal Highway Administration (FHWA) developed the Highway Safety Information System (HSIS), a multistate database containing crash, roadway inventory, and traffic volume information. Currently, eight States contribute data to HSIS. To ensure that the data are useful to transportation professionals, FHWA and the data contributors must find ways to keep all of the information in HSIS up to date.

Each year, FHWA convenes a conference for HSIS liaisons—primarily State safety data specialists who provide data to HSIS—to obtain feedback on how their data are being used by FHWA and other safety researchers. Held annually in Chapel Hill, NC, the HSIS Liaison Conference is an event aimed at keeping HSIS data current and integrated. In addition, the conference provides a forum for the liaisons to present detailed information on their own data.

Topics covered at the 2004 conference included onscene crash investigations involving median cable barriers, the safety effects of shoulder paving and widening, and research on pavement edge dropoff. Rushi Patel, an FHWA contractor, discussed a study on the magnitude of crashes involving changeable message signs and flashing arrow panels in work zones. The objective of the study was to determine if the magnitude of such crashes has changed since 1995, when HSIS staff last conducted a study addressing the issue. For the study, Patel used the same methodology as in the 1995 research, along with more recent crash data from the HSIS database. The results show that the estimated proportion of single-vehicle and fixed-object crashes involving changeable message signs and flashing arrow panels is still very small, just one-tenth of 1 percent or less. In addition, the injury severity levels for these crashes do not appear to differ significantly from the levels in any other type of fixed-object crashes.

The conference also featured a presentation on a study of the safety effects of using narrow and shoulder-use lanes to increase the capacity of urban freeways. Congestion on urban freeways often creates a need to increase the capacity of the freeway by building an additional lane, which can be done by widening the existing roadbed, restriping the traveled way with narrower lanes, converting all or part of the shoulder to a travel lane, or a combination of approaches. This study examines the safety effects of projects involving narrower lanes or shoulder conversions on existing urban freeways in California. The researchers found that projects involving expansion of a road from four lanes to five lanes can increase crash frequency by more than 10 percent. Projects that involved converting a road from five lanes to six lanes resulted in smaller increases in crash frequency.

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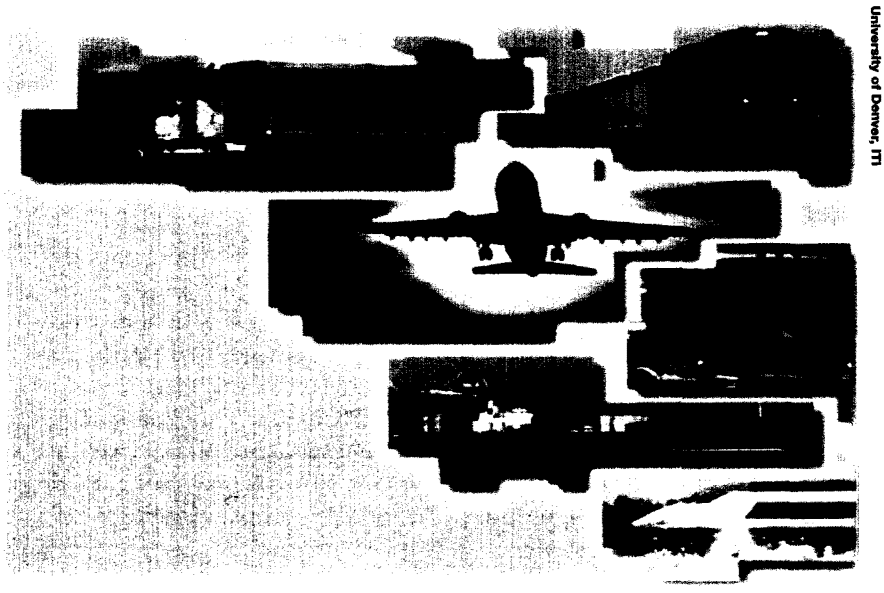
Reinvigorating the Intermodal Transportation Workforce

A significant number of senior-level transportation employees in the Federal Government and private industry will soon be eligible for retirement. Their retirements will change not only the Federal workforce, but also will create a critical need for workforce retention and development. The Intermodal Transportation Institute (ITI) at the University of Denver recognizes the critical need to educate and prepare the transportation leaders and managers of the 21st century, and ITI now offers programs that teach future transportation leaders how to develop seamless, sustainable intermodal transportation systems. One of these programs is the Executive Master's Program, where participants can earn a master of science in intermodal transportation management from the University of Denver.



University of Denver, ITI

Participants in ITI's master's program in intermodal transportation management learn about commercial transportation modes, including trains, ships, trucks, planes, and subways, such as those shown here.

The goal of the master's program is to help turn professionals into managers who are aware of the local, national, and international impacts of intermodal transportation while creating leaders who will exert a positive influence on intermodal passenger and freight transportation. The program enables professionals to work full-time while earning a graduate degree, by combining five onsite, 1-week residencies with offsite delivery methods.

The 15-month (five-quarter) program uses an interdisciplinary curriculum taught with integrated modules on numerous topics, including intermodal, freight, and passenger transportation; finance; leadership and management; and problem solving and strategic planning. Students in the program will participate in an intermodal business planning project, develop a personal leadership development strategy, and attend a travel seminar in the sixth quarter that includes trips to intermodal facilities.

To promote their common objectives, ITI also is working with the Federal Highway Administration's (FHWA) Universities and Grants Programs (U&GP) to advance transportation education and workforce development. In October 2004, ITI representatives met with the U&GP team at the National Highway Institute in Arlington, VA, to discuss mutual workforce development goals and potential partnering opportunities to advance transportation education and develop future intermodal transportation leaders and managers. ITI also participated in a panel on transportation education and workforce development at U&GP's 12th Annual Dwight David Eisenhower Transportation Fellowship Program Research Showcase on January 11, 2005, during the Transportation Research Board (TRB) Annual Meeting in Washington, DC.

Applications for the 2005 Executive Master's Program are now being accepted. For more information, call 303–871–4146, send a message to du-iti@du.edu, or visit www.du.edu/transportation. For further information regarding FHWA's U&GP, send a message to transportationedu@fhwa.dot.gov or visit www.nhi.fhwa.dot.gov.

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Pooled Fund Web Site Reorganized for Easier Navigation

The Transportation Pooled Fund (TPF) Program provides a way for organizations such as Federal, State, regional, and local transportation agencies; academic institutions; foundations; and private firms to jointly fund projects aimed at solving transportation-related problems. Through this program, which is sponsored by the Federal Highway Administration, the Transportation Research Board, and the American Association of State Highway and Transportation Officials, organizations can leverage their resources to support research, planning, and technology transfer activities that enhance the safety and efficiency of the Nation's transportation system.

To help the transportation community learn about and access the pooled fund program, several improvements have been made to the TPF Web site at www.pooledfund.org. The site, designed to function as an integral communications tool for the TPF Program, provides a central location where program participants and authorized users can post solicitations, make commitments, and obtain information about ongoing pooled fund studies. It also serves as a centralized database for information on the TPF Program.

The TPF Web site has been reorganized for easier navigation, and a graphic site map has been added to make it simpler for authorized users, including research study sponsors and participants, to find specific functions throughout the site, such as where solicitations for new projects are posted and where records of ongoing studies are kept. Other changes are designed to benefit site users who are participating in pooled fund studies or exchanging information on proposed research. Study participants may now commit funds online to support ongoing studies, a change that will benefit studies requiring additional funding as new research tasks are added. In addition, study sponsors may indicate whether they are accepting commitments only from existing partners or are accepting new participants.

Visitors to the site also can sign up to receive automated messages about new study solicitations. When a new solicitation for a proposed study is posted on the site, the system notifies key contacts and subscribers who have asked for that information. The system also alerts study sponsors each time a participant commits funds to a study, reminds sponsors to obligate funds, and alerts partners if a solicitation is withdrawn because of insufficient commitments. In addition, participants are notified automatically when quarterly reports, final reports, or other study documents are posted on the site.

The pooled fund Web site was developed with support from the National Cooperative Highway Research Program and is hosted by the Texas Transportation Institute. Originally launched in December 2002, the Web site now includes information on 240 active studies with a total value of approximately $155 million.

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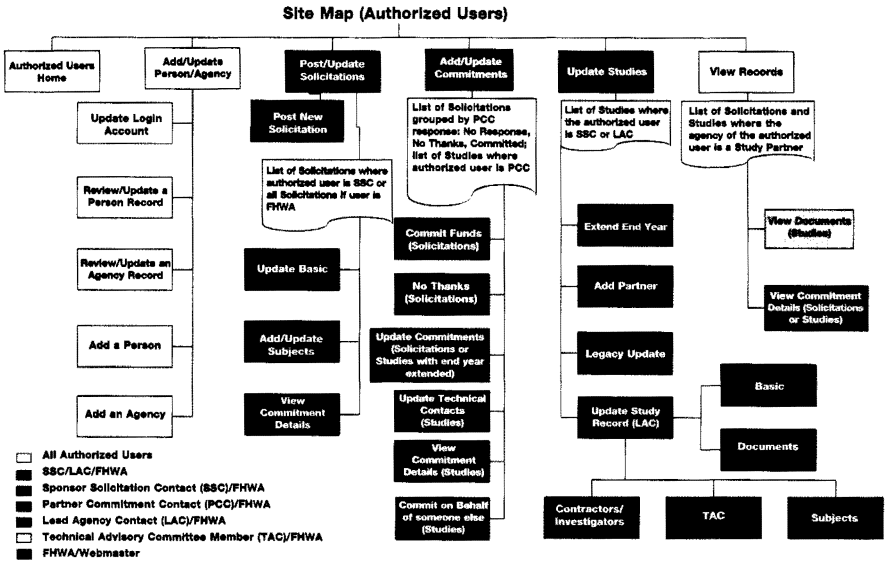

A new site map guides authorized users through the Transportation Pooled Fund Program Web site and makes it easier to find specific functions.

FHWA Releases New Handbook on Configuration Management

Many transportation professionals may not be familiar with the term "configuration management" (CM), which refers to a series of processes and procedures developed by the information technology community to establish and maintain the integrity of a system. CM programs and plans provide technical and administrative direction for the implementation of procedures, functions, services, tools, processes, and resources that are required for successful development and support of a system. Applicable to any complex system, including intelligent transportation systems (ITS) or transportation management systems (TMS), CM can help staff at highway agencies consider how altering a transportation subsystem might affect the larger system in which it functions and might minimize any adverse effects on system operations.

ITS and TMS technologies are becoming more sophisticated due in large part to the addition of new functional capabilities and their overall physical expansion. The need to control the rapid pace of change in these systems is paramount to ensure their efficient and reliable operation. Over time, CM will reduce operating and maintenance costs for ITS and TMS systems, while improving performance and reliability. To help agencies meet their growing CM needs, the Federal Highway Administration's (FHWA) Office of Operations worked with Dr. Brian Smith of the University of Virginia's Smart Travel Laboratory to develop the *Configuration Management for Transportation Management Systems Handbook* (FHWA-OP-04-013).

This handbook is intended to provide guidance on the use of CM tools for transportation professionals at highway agencies that are responsible for developing and maintaining complex ITS and transportation management systems. Viable CM programs will help agency staff ensure that their system's documentation is consistent with its actual physical design, that current and accurate baseline information on the system will be available if needed for disaster recovery, and that records have been created and are being maintained to track the system's life cycle.

The handbook provides current examples and resources from CM planning documents. The handbook also discusses the role that CM plays during the life cycle of a large transportation system or project. Implementing CM for a large transportation system or project ensures that the transition stage between development and operations, where the burden of ownership often shifts from contractors to State departments of transportation, is well documented. In addition, the new handbook provides guidance on CM strategies for regionally interoperable transportation systems.

The handbook also will serve as the primary resource for a 2-day training course by the National Highway Institute to help professionals specializing in traffic management and intelligent transportation systems make decisions influencing resource allocations. For more information, visit http://nhi.fhwa.dot.gov. In addition to the handbook, FHWA has developed several related resources, which are available at http://tmcpfs.ops.fhwa.dot.gov.

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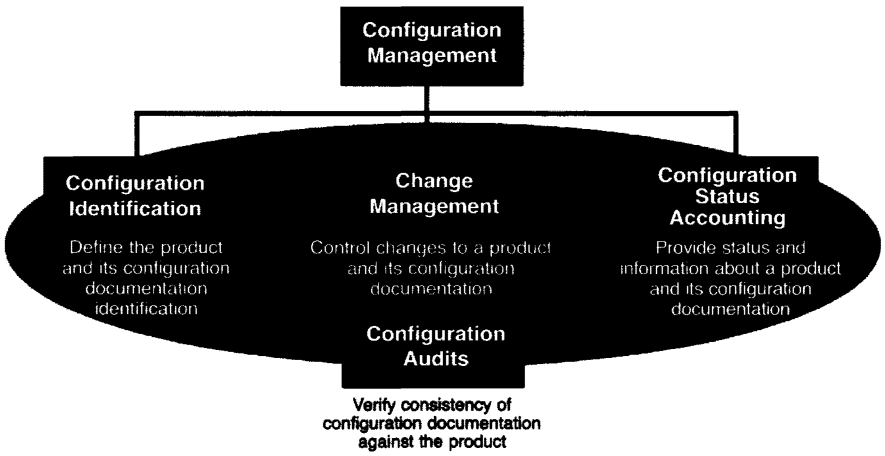

This figure graphically demonstrates the general CM process, which consists of the following elements: configuration identification, change management, configuration status accounting, and configuration audits.

(Continued from page 1)

increase its advanced efforts and then established the following definition for advanced research:

> *Research that involves and draws upon basic research results to provide a better understanding of phenomena and develop innovative solutions. [It is] sometimes referred to as exploratory research in order to convey its more fundamental character, its broader objectives, and the greater uncertainty in expected outcomes compared to problem-solving research.*

After defining advanced research, selected research projects were peer reviewed to establish an advanced research investment baseline. Examples of reviewed projects include development of new nondestructive evaluation methods for portland cement concrete, development of new types of steel or asphalt materials, and innovative approaches to reduce the impacts of climate change and variability on transportation systems. The next step, which the Office of Corporate R&T currently is undertaking, is developing a mission-oriented advanced research agenda.

The Office of Corporate R&T also is establishing an agency approach to defining technology and innovation deployment. FHWA plans to implement the new approach in April 2005. The determination of a deployment goal or criteria is crucial for the agency to manage efforts related to declaring the success of priority, market-ready technologies.

In addition to all of these recent and current activities, FHWA hosted a booth during the Transportation Research Board's 2005 Annual Meeting that featured technical experts from FHWA and State highway agencies, who provided product demonstrations and showcased innovative technologies. Participants at the showcase gained hands-on experience and talked to FHWA and State experts on the benefits of several new tools. Information on the agency's 29 priority, market-ready technologies also was on display, along with a compilation of one-page briefings from the FHWA Resource Center called the *Technology and Innovation Resource Guide.* This publication includes the agency's market-ready technologies and many other solutions that are being deployed successfully by various State departments of transportation.

Communication is a driving factor in the successful delivery of the agency's R&T program. To accomplish two-way communication, the Office of Corporate R&T is creating an integrated research and technology information management system to provide stakeholders the opportunity to be involved in the R&T program. The system includes an updated Web site that will serve as a centralized access point for information on R&T activities and a knowledge repository for related programs and projects.

For more information on the R&T corporate master plan, including periodic updates on implementation of the plan, visit www.fhwa.dot.gov/rnt4u/cmp.htm. To learn more about FHWA's R&T program, visit www.fhwa.dot.gov/rnt4u/index.htm.

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FHWA Corporate Master Plan for Research and Development of Technology & Innovation

Guiding Principle #1
The FHWA R&T process, from research through implementation, is systematic and begins with the end in mind.

Guiding Principle #2
FHWA engages in advanced and applied research, and innovation deployment activities where there is an appropriate Federal role.

Guiding Principle #3
Stakeholders are engaged throughout the R&T process.

Guiding Principle #4
The R&T process is grounded in the FHWA mission and goals, and guided by multiyear plans.

Guiding Principle #5
The R&T budget allocation is based on and driven by multiyear plans and priorities.

Guiding Principle #6
FHWA measures the performance of R&T on the agency, program, and project levels.

Guiding Principle #7
FHWA effectively communicates its R&T program and projects.

AASHTO Group Adds New Technologies to Implementation List

Introducing innovative transportation technologies into day-to-day practice can save time, money, and lives. But before new technologies can be implemented, transportation professionals need to become aware of them and learn how their operations can benefit from the innovative approaches. The American Association of State Highway and Transportation Officials (AASHTO) created the Technology Implementation Group (TIG) to identify ready-to-use technologies with a potentially high payoff and to champion their use throughout the Nation.

The AASHTO TIG recently added three technologies to the roster of tools available for use by transportation agencies. The new tools, which include road safety audits, cable median barriers, and weigh-in-motion technologies, join nine focus technologies selected earlier by TIG. All of TIG's focus technologies are included on the Federal Highway Administration's (FHWA) list of priority, market-ready technologies—a compilation of innovative approaches that not only support the agency's goals, but also include the tools and expertise needed to support implementation.

A road safety audit is a formal safety performance examination of an existing or future road or intersection by an independent team of experts. The audit team assesses the crash potential of the roadway or intersection and prepares a report that identifies potential safety issues for correction. Road safety audits completed during a project's planning stage can identify potential safety hazards before they are built into the project. The South Carolina Department of Transportation (DOT), for example, saved thousands of dollars with its first road safety audit when a design deficiency was identified and corrected before the road was built.

A cable median barrier is a cost effective, flexible traffic barrier that can help prevent crossover crashes on highways separated by traversable medians. This type of traffic barrier differs from concrete and metal-beam barriers because it can perform effectively even when installed on moderately sloped terrain. Installation costs for cable barriers are relatively low compared to other barrier types, and the need for site preparation in existing medians is minimal. The North Carolina and Oregon DOTs, which installed cable barriers in the medians of freeways originally built without barriers, report nearly 100-percent effectiveness in preventing deadly crossover crashes.

Weigh-in-motion technologies measure the weight of moving trucks and are used by State highway agencies to identify overweight trucks that can damage highway pavements. The weigh-in-motion system used in North Dakota, for example, collects data on the type and weight of a passing truck and then transmits the results to the State highway patrol without requiring the trucks to stop at conventional weigh stations. North Dakota DOT uses wireless communications to link its twelve weigh-in-motion sites to highway patrol vehicles.

For more information on TIG focus technologies, visit http://tig.transportation.org, or contact Jeremy Fissel at 202–624–3640 or jfissel@aashto.org. To learn more about FHWA priority technologies, visit www.fhwa.dot.gov/rmt4u/pti.htm.

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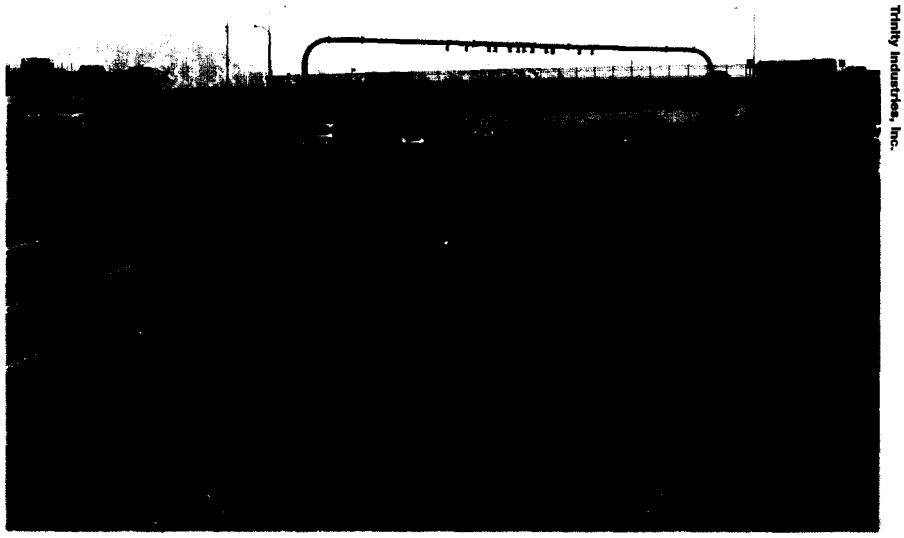

Trinity Industries, Inc.

Cable median barriers, such as this one installed on a Utah highway, offer a cost effective way to prevent crossover crashes on roads with traversable medians.

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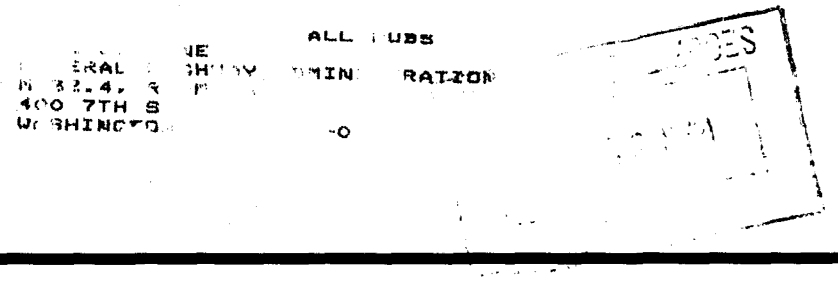

TRAINING

NHI Helps Training Developers Get It "Just Right"

Transportation professionals expect high-quality training that they can apply on the job. Budgets for developing training programs are limited, however, so developers of training courses must create programs that meet real-world needs while observing financial constraints. Currently, many courses are developed from an "everything you need to know" viewpoint, which can provide unnecessary information and waste scarce resources. Systematic development processes, such as the Instructional Systems Design (ISD) model, can help course developers create targeted training that builds the knowledge, skills, and abilities that participants need on the job. Using the ISD model, course developers analyze what is to be learned, devise a teaching plan that establishes the conditions for learning, and produce and refine instructional or noninstructional interventions (procedures) until the participants meet specified objectives.

To help training developers learn how to create informative, cost effective training, the National Highway Institute (NHI) has introduced the Developing High-Impact Training Series (#420046C), which provides an indepth understanding of the ISD model.

The course comprises six 1-hour sessions, which NHI will present using the Microsoft® Live Meeting Web conferencing tool, which enables students to participate via the Internet. The first session is an overview of the ISD model, while each of the following sessions focuses on one phase of an ISD process known as ADDIE—Analysis, Design, Development, Implementation, and Evaluation. The ADDIE process enables developers to determine what needs to be learned, by whom, and with what existing skills, and to map out how learning is to be presented, practiced, remediated, and tested. Course developers then are able to produce effective, high-quality materials, plan for and implement the course, and collect data about the adequacy of the intervention.

Upon completing the course, participants will know how to decide whether to develop a training program, profile their training audiences, and select a training delivery method. In addition, they will know how to establish goals and learning outcomes for the training, and use those desired outcomes to determine what to include in the program. Participants also will learn how to format and convey the course content so that it can be learned easily and how to use application exercises for practicing newly learned content. Finally, participants will learn how to assess for comprehension and evaluate the success of their training programs.

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