

FHWA R&T Now ~ January 2010~

A news update of research, technology, and development from the U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA)

GENERAL/ADMINISTRATIVE

-FHWA at TRB's Annual Meeting-

FHWA valued the opportunity to meet with stakeholders at the Transportation Research Board (TRB) 89th Annual Meeting: **Investing in Our Transportation Future—BOLD Ideas to Meet BIG Challenges**. Out of the nearly 500 FHWA employees who participated in the 2010 TRB annual meeting, 120 of them participated in technical sessions. FHWA hosted 45 additional meetings and displayed more than 35 exhibits.

-Certificate of Appreciation Awarded at TRB International Participants' Reception-

Dr. John Munro and Ms. Debra Elston were honored by TRB for their contributions to the report entitled *European—United States Transportation Research Collaboration, Challenges and Opportunities*. A special certificate of appreciation was awarded to them at Sunday's TRB International Participants' Reception, in the Hilton Hotel's International Ballroom East.

-Every Day Counts Initiative-

Since the launch of FHWA Administrator Victor M. Mendez's *Every Day Counts* (EDC) initiative, the accelerated deployment of innovative technologies team has identified 13 candidate technologies/groups of technologies using a collaborative process based on input from FHWA staff and stakeholders. This was particularly challenging because there are so many promising technologies. On January 26 a selection panel comprised of FHWA staff and stakeholders will review and rate the candidate technologies to narrow the selection to approximately five technologies. Following the selection, FHWA will establish Innovation Deployment Partnership Teams (IDPTs) to develop and carry out the implementation plans comprising roadmaps, and communication and marketing plans. The IDPTs will be responsible for identifying implementation strategies, providing technical support, developing performance measures, defining expectations, monitoring results, documenting best practices, and reporting outcomes. Each deployment plan will include specific milestones, budget and resource projections, and completion targets. FHWA expects to complete the implementation plans by April 2010, bearing in mind that "every day counts."

The Accelerating Innovative Technologies component of the EDC Initiative will provide an opportunity to focus on several promising technologies so they become state-of-the-practice solutions in order to address some of the most challenging issues facing the Nation. FHWA plans to improve the overall delivery for the future efforts, building on current initiatives and lessons learned from programs such as Highways for LIFE.

FHWA welcomes suggestions on how the Agency can accelerate the delivery of innovative technologies and enhance the methods for accelerated deployment. A dedicated electronic mailbox has been established for staff and stakeholder contributions: everydaycounts@dot.gov

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-Planning for SHRP 2 Implementation-

Strategic Highway Research Program (SHRP) 2 research continues to progress on schedule, and has reached the midpoint of its 7-year life. The first research results are now becoming available, and FHWA is

actively working with TRB and the American Association of State Highway and Transportation Officials to guide the pre-implementation planning phase of SHRP 2.

SHRP 2 Implementation Team Director Margie Sheriff is busy engaging all FHWA staff in discussions on SHRP 2 research and the roles the program offices, division offices, and the Office of Technical Services will play to ensure a smooth transition from research to deployment. FHWA is also working with the National Highway Traffic Safety Administration to plan for the SHRP2 Safety research results. SHRP2 implementation is a priority within FHWA's FY2010 Strategic Implementation Plan. The scale of the implementation effort will depend on program funding for SHRP 2 implementation, which will be decided once Congress passes authorization legislation and appropriates funds.

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-RITA Seeking Input on Its 5-Year Strategic Plan-

The Research and Innovative Technology Administration (RITA) and its partners are seeking public stakeholder input on research strategies and metrics necessary to achieve USDOT strategic transportation goals and to drive transportation policy in both the short and long terms. The USDOT's research, development, and technology efforts and outcomes play critical roles in attaining the vision of a safe, truly multimodal transportation system that provides the traveling public and U.S. businesses with safe, convenient, affordable and environmentally sustainable transportation choices. A previous USDOT Research, Development, and Technology Strategic Plan was published in 2006 and served as a compendium of modal research pursuits at that time. USDOT is now pursuing a more cross-modal, collaborative and strategic planning process to cover the years 2010–2015 and to address the proposed departmental key priorities as outlined in the *Federal Register* background section. The *Federal Register* notice is open for comments until February 8, 2010.

http://www.rita.dot.gov/publications/federal_register/2010/html/rita_2010_01_08.html

ADVANCED RESEARCH

-FHWA EAR Program Results-

The Exploratory Advanced Research (EAR) Program strives to develop partnerships with the public and private sectors because the very nature of EAR is to apply ideas across traditional fields of research and stimulate new approaches to problem solving. Between FY 2007 and FY 2009, the EAR Program awarded 25 projects involving both government and academic researchers. These projects represent the investment of \$22.6 million in FHWA funds and leverage \$12 million in matching funds. The EAR Program bridges basic research (e.g., academic work funded by National Science Foundation grants) and applied research (e.g., studies funded by State departments of transportation). Research may include improved understanding of phenomena that can accelerate or allow for new lines of applied research. An example is a project called "Increased Understanding of Driver Visibility Requirements," in which investigators are developing a rational, theoretical framework for determining the quantity and quality of visual information needed by drivers to navigate the roadway safely and effectively. This work will assist in future safety research. In addition to sponsoring EAR projects that advance the development of highway infrastructure and operations, the EAR Program is committed to promoting cross-fertilization with other technical fields, furthering promising lines of research, and deepening vital research capacity.

For more information about the EAR Program, contact:

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-FHWA EAR Program Awards Research on Nanoscale Approaches for Inhibiting Corrosion-

As a result of a Broad Agency Announcement for EAR Proposals issued in April 2009, FHWA entered into a cooperative agreement with the City College of New York to develop novel, nanotechnology-based green coatings for corrosion protection of new and existing steel highway infrastructure. For this research project, the researchers will investigate two coating systems and compare them to traditional steel anti-corrosive coatings. They will use conductive polymer nanoparticles in the two proposed coatings to provide electrochemical corrosion inhibition, carbon-black additives to improve the scratch resistance and toughness of these coatings, and metallic nanoparticles to improve the dispersion of the additives. They will then compare the proposed new coatings to a traditional zinc-enhanced, epoxy-based coating for both mechanical strength and corrosion protection. The advantage of the nanotechnology-based coatings lies in their expected ability, with a very low concentration of additives, to provide significant corrosion protection while improving adhesion strength and scratch resistance. This could lead to significant savings in their life-cycle costs. For more information about the project, contact Paul Virmani, (202) 493-3052, paul.virmani@dot.gov.

For more information about the EAR Program, contact:

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-FHWA EAR Program Initiates Research on Innovative Approaches for Next Generation Vehicle Positioning-

FHWA entered into a contract with the University of California, Riverside, for a 3-year research project on vehicle-infrastructure cooperation technologies. Researchers will assess the viability, benefits, limitations, and obstacles for different approaches for vehicle positioning based on technological, business, and deployment characteristics. In particular, they will focus phase I of the research on how the sensors measuring the physical road environment (vision, radar and lidar), electromagnetic infrastructure (Next Generation Vehicle Positioning), and local vehicle-to-vehicle and vehicle-to-infrastructure communications infrastructure can serve as additional augmentation mechanisms to improve vehicle positioning. A second phase will include the testing of several of the viable approaches. The award is a result of a national Broad Agency Announcement for EAR Proposals issued in December 2008. For more information about the project, contact David Gibson, (202) 493-3271, david.gibson@dot.gov.

For more information about the EAR Program, contact:

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-Fact Sheet: Time-Frequency Analysis Mathematical Analysis of the Empirical Mode Decomposition-

Over the past decade, Empirical Mode Decomposition (EMD) has been used in a wide range of fields, including biology, geophysics, ocean research, radar, and medicine. The algorithm has been fine-tuned and extended in a variety of different directions, however, remarkably little is known about the mathematical properties, and very little mathematical research had been conducted on EMD. EMD's ability to detect subtle changes in time-dependent signals makes it of particular importance and highly relevant to transportation requirements. In addition to assessing and monitoring bridges and structures, it serves as a vital tool in the detection of early signs of fatigue in vibrating metal components and can detect even the onset of irregularities in engine function that precede major breakdowns. Early detection of subtle changes makes it possible to diagnose serious mechanical problems in machinery before they are permitted to cause serious damage. The innovative ideas developed for this project can currently be categorized into two classes: one part researching a "mathematical cleanup" of the sometimes very ad hoc components of the EMD algorithm, and the other part, a "mathematical reformulation," attempting to develop a more rigorous

mathematical approach in the same spirit as the original EMD, but using different geometric tools. For more information, contact:

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<http://www.fhwa.dot.gov/advancedresearch/pubs/10029/index.cfm>

-Fact Sheet: Real-Time Pedestrian Detection Layered Object Recognition System for Pedestrian Collision Sensing-

At this time pedestrian detection can be achieved using fixed cameras pointing at predetermined zones, or through the use of vehicle-mounted camera systems. Both systems can detect pedestrians, while vehicle-mounted systems can also detect additional objects such as other vehicles, buildings, and zebra crossings. This EAR project moves beyond current systems and integrates two- and three-dimensional technology to provide cues for potential locations of pedestrians. For more information, contact:

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<http://www.fhwa.dot.gov/advancedresearch/pubs/10022/index.cfm>

-Fact Sheet: Driving Automation Forward: Human Factors for Limited-Ability Autonomous Driving Systems-

In-vehicle innovations have steadily evolved to supplement the driver's ability during normal driving and to augment the driver's ability to respond to critical situations. Most recently, some manufacturers in Asia and Europe already have introduced collision-mitigation braking systems and lane-keeping systems. New features, such as a lane-centering system that also controls steering, indicate that it will not be long before vehicles are on the market that can move autonomously for substantial distances toward a destination with limited driver input.

This EAR project addresses a critical technology and knowledge gap that limits the near-term availability of vehicles able to control their own speed and steering for substantial distances on public roads. This gap exists in how to help drivers maintain adequate situation awareness so that they are prepared to intervene when traffic conditions require. With this in mind, two next-generation driver-assistance technologies that provide longitudinal and lateral control automation, smart adaptive cruise control and lane centering, will be used in human factor studies and experiments in simulators, on test tracks, and on public roads. These trials will address concerns raised by previous research, regarding the need to carefully design autonomous driving systems to avoid potential adverse effects from driver inattention, when they are made available to the general public. For more information, contact:

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<http://www.fhwa.dot.gov/advancedresearch/pubs/10021/index.cfm>

-FHWA EAR Program Updates Focus Areas for FY 2010-

In anticipation of a new Broad Agency Announcement, the FHWA EAR has updated its Focus Areas for FY 2010.

Integrated Highway System Concepts—This focus area emphasizes the longer-term needs to reach critical departmental safety and mobility goals by developing the theory and assessing feasibility for systems that leapfrog current technological approaches for linking infrastructure with future vehicle and personal mobile technology.

Nano-Scale Research—This focus area cuts across all functional areas and takes advantages of higher magnitudes of investment from other agencies to support of greater highway system resilience, improved safety and operations, and reduced environmental impacts. It encompasses modeling and measuring phenomena to increase an understanding of properties as well as the application of scientific advances from other fields critical to improving the safety, reliability, and resilience of the highway system.

Human Behavior and Travel Choices—This focus area leverages research concepts from the social sciences including psychology and economics along with more traditional research for improving safety, reducing congestion, and improving the livability of the Nation's communities.

New Technology and Advanced Policies for Energy and Resource Conservation—This focus area cuts across infrastructure, operations and societal and complex natural systems to support innovative methods for reducing highway industry costs and move towards sustainability.

Information Sciences—This focus area takes advantage of paradigm shifting breakthroughs found across academia, government, and the private sector in the computer and information technology fields including automation, data processing and management, computing, cyber (or virtual) systems, communication, and visualization.

Breakthrough Concepts in Material Science—This focus area leverages new approaches in materials science to produce innovative new highway materials with characteristics that enable enhanced functionality (including multifunctionality), constructability, sustainability, cost effectiveness or operating characteristics of highway infrastructure and system monitoring sensors to enhance highway safety, reliability, and resilience.

Technology for Assessing Performance—This focus area seeks novel approaches and breakthrough technology that will revolutionize the use of performance management in the highway sector.

For more information about the EAR Program, contact:

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INFRASTRUCTURE

-Computer-Based Guidelines for Concrete Pavements: HIPERPAV III USER MANUAL-

The High Performance Paving (HIPERPAV[®]) III software program is a comprehensive yet user-friendly software package. This software program will be of interest to those involved in concrete pavement mix designs as well as the design and construction of concrete pavements. In this user manual, guidance is given on how to use the new HIPERPAV III software program for the analysis of early-age Portland cement concrete pavement behavior.

<http://www.fhwa.dot.gov/publications/research/pavements/09048/index.cfm>

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-Multimedia: Calibrating the Falling Weight Deflectometer Video-

This video addresses the question "Why should you calibrate your Falling Weight Deflectometer (FWD)?" It is intended to educate FWD managers, engineers, and operators on the need for calibrating FWD equipment in order to collect high quality data for durable pavement designs.

<http://www.fhwa.dot.gov/multimedia/research/infrastructure/calibration/index.cfm>

-Report: Bridge Pressure Flow Scour for Clear Water Conditions-

The Bridge Pressure Flow Scour for Clear Water Conditions Study described in this report was conducted at the FHWA Turner-Fairbank Highway Research Center J. Sterling Jones Hydraulics Laboratory. The study was in response to a request of several State transportation departments asking for a new design guidance to predict bridge pressure flow scour for clear water conditions. The new pressure flow scour procedure will replace the existing pressure flow scour prediction method in the FHWA Hydraulic Engineering Circular No. 18 (4th edition) *Evaluating Scour at Bridges*. The study includes experiments (physical modeling) at the Hydraulics Laboratory. This report will be of interest to hydraulic and bridge engineers who are involved in estimating pressure flow scour for inundated bridge decks.

<http://www.fhwa.dot.gov/publications/research/infrastructure/structures/09041/index.cfm>

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-TechBrief: High Performance Concrete Bridge Deck Investigation-

This TechBrief provides a summary of an investigation that assessed the performance of high performance concrete bridge decks.

<http://www.fhwa.dot.gov/publications/research/infrastructure/structures/09070/index.cfm>

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-TechBrief: Structural Behavior of a Prototype UHPC Pi-Girder-

This TechBrief highlights the results of a research program that evaluated an ultra-high performance concrete (UHPC) pi-girder cross section prototype developed for use in short- and medium-span highway bridge applications.

<http://www.fhwa.dot.gov/publications/research/infrastructure/structures/09068/index.cfm>

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-TechBrief: Structural Behavior of a Second Generation UHPC Pi-Girder-

This TechBrief highlights the results of a research program that evaluated a second generation UHPC pi-girder cross section developed for use in short- and medium-span highway bridge applications.

<http://www.fhwa.dot.gov/publications/research/infrastructure/structures/09069/index.cfm>

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-Report: Development of a Multiaxial Viscoelastoplastic Continuum Damage Model for Asphalt Mixtures-

This report highlights findings from the FHWA project that focused on the development of the multiaxial viscoelastoplastic continuum damage model for asphalt concrete in both compression and tension.

<http://www.fhwa.dot.gov/publications/research/infrastructure/pavements/08073/index.cfm>

SAFETY

-Introducing the Crash Modification Factors Clearinghouse-

The FHWA has established the Crash Modification Factors (CMF) Clearinghouse to support and enable transportation professionals to identify the most appropriate countermeasure to address their safety needs. A CMF is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. The CMF Clearinghouse presents both CMFs and Crash Reduction Factors (CRF), which are estimates of the percentage reduction in crashes. The CMF Clearinghouse contains a searchable database of CRFs, allowing users to search by countermeasure, crash type and severity, as well as other variables. Transportation professionals can also submit their own CMF studies for inclusion into the CMF clearinghouse.

Visit the CMF Clearinghouse at:

www.CMFClearinghouse.org

-Older Driver/Senior Mobility Series-

Because the number of older drivers is increasing—by the year 2020, adults aged 65 and older are projected to make up 20 percent of the population—it is necessary to design highways and roadside equipment with older drivers in mind. For a better understanding of older drivers and transportation, see articles that were printed in the FHWA's *Public Roads* magazine at:

<http://www.fhwa.dot.gov/research/topics/safety/humanfactors/olderdriver/pubroadslst.cfm>

-TechBriefs Present Six Alternative Intersections and Interchanges-

The Office of Safety R&D announces the availability of six technical summaries (TechBriefs) of recently completed research into alternative intersections and interchanges. These nontraditional designs offer substantial advantages under certain conditions compared to corresponding conventional at-grade intersections or grade-separated diamond interchanges. The TechBriefs, and the corresponding full report (see below), address geometric design features, operational and safety issues, access management, costs, construction sequencing, environmental benefits, and applicability of each design.

-“[TechBrief: Double Crossover Diamond Interchange](#)” (FHWA-HRT-09-054)

-“[TechBrief: Displaced Left-Turn Intersection](#)” (FHWA-HRT-09-055)

-“[TechBrief: Displaced Left-Turn Interchange](#)” (FHWA-HRT-09-056)

-“[TechBrief: Median U-Turn Intersection](#)” (FHWA-HRT-09-057)

-“[TechBrief: Quadrant Roadway Intersection](#)” (FHWA-HRT-09-058)

-“[TechBrief: Restricted Crossing U-Turn Intersection](#)” (FHWA-HRT-09-059)

The complete final report of this work will be available in the Spring, 2010, and will cover all six designs in greater detail. That report is titled *Alternative Intersections/Interchanges: Informational Report* (FHWA-HRT-09-060). For more information contact:

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-New Reports and TechBriefs from Low Cost Safety Improvements Pooled Fund Study-

Twenty-eight States are participating in the ongoing FHWA Low Cost Safety Improvements Pooled Fund Study in support of the FHWA Strategic Highway Safety Plan. The study's purposes are to estimate the

safety effectiveness of a number of the unproven low-cost safety strategies identified in the *National Cooperative Highway Research Program (NCHRP) Report 500 Series*, and to provide a Crash Reduction Factor and Benefit/Cost economic analysis for each of the targeted safety strategies. The following reports present recently completed research into specific low cost treatments considered in this study.

Corresponding TechBriefs provide practical summaries of the work reported.

-Report – “[Safety Evaluation of Advance Street Name Signs](#)” (FHWA-HRT-09-029); [TechBrief](#) (FHWA-HRT-09-030)

-Report – “[Safety Evaluation of Lane and Shoulder Width Combinations on Rural, Two-Lane, Undivided Roads](#)” (FHWA-HRT-09-031); [TechBrief](#) (FHWA-HRT-09-032)

-Report – “[Safety Evaluation of Offset Improvements for Left-Turn Lanes](#)” (FHWA-HRT-09-035); [TechBrief](#) (FHWA-HRT-09-036)

-Report – “[Safety Evaluation of Improved Curve Delineation](#)” (FHWA-HRT-09-045) [TechBrief](#) (FHWA-HRT-09-046)

-TechBrief -- “[Simulator Evaluation of Low-Cost Safety Improvements on Rural Two-Lane Undivided Roads: Nighttime Delineation for Curves and Traffic Calming for Small Towns](#)” (FHWA- HRT-09-062)

For more information contact:

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-Report Considers the Effects of In-Vehicle and Infrastructure-Based Collision Warnings at Signalized Intersections-

The Office of Safety R&D has released a report titled “[The Effects of In-Vehicle and Infrastructure-Based Collision Warnings at Signalized Intersections](#)” (FHWA-HRT-09049). The potential effectiveness of warnings to drivers of the imminent threat of a collision with a red light violator was evaluated in an experiment that used a driving simulator. Three warnings were tested: (1) an infrastructure-based warning that immediately turned the traffic signal red and activated red wig-wag lights, (2) an in-vehicle warning that consisted of a brake pulse, voice annunciation, and activation of a red dashboard light, and (3) simultaneous activation of both of these warnings. In addition to testing three warnings with different groups of drivers, drivers in each group were exposed to one of three traffic conditions: (1) driving with no other vehicles ahead or behind, (2) following closely to another vehicle, or (3) being closely followed by another vehicle. For more information contact:

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-TechBrief: Surrogate Safety Assessment Model -

This document is a technical summary of the FHWA report, *Surrogate Safety Assessment Model and Validation: Final Report* (FHWA-HRT-08-051). This TechBrief summarizes the research and development of the Surrogate Safety Assessment Model, a technique combining microsimulation and automated conflict analysis, which analyzes the frequency and character of narrowly averted vehicle-to-vehicle collisions in traffic, to assess the safety of traffic facilities without waiting for a statistically above-normal number of crashes and injuries to actually occur.

<http://www.fhwa.dot.gov/publications/research/safety/10020/index.cfm>

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OPERATIONS

FHWA Research Engineer to Take Over as New Chair of the User Information Systems Committee

At the TRB 89th Annual Meeting, Dr. David Yang, Travel Management Team, Office of Operations R&D, was appointed as the new chairperson for TRB's User Information Systems Committee, AND20. He will begin serving his first 3-year term on April 15, 2010. Yang will lead the User Information Systems Committee and work closely with TRB staff, committee members, and subject experts to update the committee's tri-annual report. Additionally, he will form alliance with other TRB technical committees and professional organizations to plan and organize future TRB conference sessions and research exchanges related to traveler and driver information. The User Information Systems Committee has two subcommittees: the Advanced Traveler Information Systems Joint Subcommittee and the Digital Billboards Joint Subcommittee. For more information, contact:

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RECENT PERIODICALS

-FOCUS Newsletter—December 2009-

This issue includes: Strategic, Safe, and Sustainable: Today's Vision for Pavements; Your Online Guide to Bolted Connections; Bridge Scour Prediction and Analysis: the Power of FLOP; Building Better Concrete Pavements with HIPERPAV III; Excellence in Highway Design 2010; Highway Technology Calendar; and, Nothing But Net: TRB Annual Meeting to Feature Highways for LIFE Success Stories.

<http://www.fhwa.dot.gov/publications/focus/09dec/index.cfm>

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-FOCUS Newsletter—November 2009-

This issue includes: Multisector Asset Management: Achieving Greater Innovation, Efficiency, and Value; Celebrating 25 Years of Bridge Technology Advances in the United States and Japan; FWD Calibration: Today's Improvements and Future Plans; Countermeasure Design for Bridge Scour; An Online Introduction to Lightweight High Performance Concrete; and, Highway Technology Calendar.

<http://www.fhwa.dot.gov/publications/focus/09nov/index.cfm>

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-Public Roads—January/February 2010-

This issue includes: Highways for LIFE; Visualization's Next Frontier; Spotlight on Senior Mobility; Handy Lessons from Overseas on Walking and Bicycling; Risking Success Through Flexible Design; and, Practical Design.

<http://www.tfrc.gov/pubrds/10janfeb/>

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-Innovator—Accelerating Innovation for the American Driving Experience—October/November 2009-

This issue includes: Simple Bridge Design Uses High-Performance Materials; Safety Edge Catches On as Life-Saving Technique; Project Tests Innovation to Boost Asphalt Pavement Quality; Closer Look: Innovation Saved Time, Money on Virginia Project; Web Seminar Explains Modern Roundabouts; and, Calendar.

<http://www.fhwa.dot.gov/hfl/innovator/issue15.cfm>

-Transportation and Climate Change Newsletter –November/December 2009-

This issue includes: United Nations Framework Convention on Climate Change; EPA Issues First Fuel Economy Trends Report Including CO2 Emissions Florida-Dutch Cooperation On Climate Change Adaptation Deepens; and, What Is “Cap and Trade,” Which Has Been Proposed To Reduce GHG Emissions?

<http://www.fhwa.dot.gov/hep/climatechange/newsletter/ccnews1209.htm>

-Centered on Service- December 2009-

This issue includes: Collins Selected to Serve as Resource Center Director; FHWA Offers Help to States Evaluating Locally Owned Bridges for Scour; WVDOT Tackles Fiber Reinforced Polymers & Strengthening Highway Structures; Visualization: A Key Tool in Planning; PDS Update: ACS Lite Training for Signal Timing Comes to TX; Sign Retroreflectivity Toolkit Now Available; Accelerated Bridge Construction PDS Coming to SC; Local ABC Workshop in MD; NEW Cost Estimation Workshop; and; Calendar of Events.

<http://www.fhwa.dot.gov/resourcecenter/success/cosvol5iss4.cfm>

Links:

Turner-Fairbank Highway Research Center: www.tfhrc.gov

Resource Center: <http://www.fhwa.dot.gov/resourcecenter/>

National Highway Institute: <http://www.nhi.fhwa.dot.gov/home.aspx>

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Suggestions may be submitted to: FHWA_Now@fhwa.dot.gov