

FHWA R&T Now

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

May/June 2018

POLICY & PARTNERSHIPS

Mini-Roundabout Helps Make a Dangerous Intersection Safer

Through a Small Business Innovation Research contract managed by Dr. Wei Zhang, intersection safety research engineer at Federal Highway Administration's (FHWA's) Turner-Fairbank Highway Research Center, a modular approach of constructing mini-roundabouts was developed and field demonstrated at an intersection in Annandale, VA, during the May 16–25, 2018, time frame. A modular approach to construction means that the components needed for the roundabout were prefabricated elsewhere and shipped to the site for assembly.

The current two-way-stop-control intersection is dangerous for traffic entering from side streets and for making left turns. It's also very dangerous for pedestrians who wish to cross the major road.

This mini-roundabout design will preserve the capacity on the major road, provide safe gaps to minor road traffic, and cut the pedestrian crossing distance from 60 feet to 12 feet with two-stage crossing.

The mini-roundabout will be environmentally friendly. The raised islands are made of engineered plastic boards that were developed from recycled plastic bottles.

"If the materials and design are successful, we may be able to consider similar modular roundabouts as an option where safety and congestion improvements are needed quickly," said Wei.



A rendering of the mini-roundabout in Annandale, VA. (Source: FHWA)

The project was completed in partnership with the Virginia Department of Transportation (VDOT) Northern Virginia District, and the Fairfax County department of transportation. The team from FHWA performed the traffic capacity analysis and the engineering design, and VDOT provided the crew for installation.

For more information, contact Wei Zhang, 202–493–3317, wei.zhang@dot.gov.



U.S. Department
of Transportation
**Federal Highway
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EXPLORATORY ADVANCED RESEARCH

TRL Assessments Aid Research

Technology Readiness Level (TRL) Assessments help determine the maturity of a technology and provide a foundation for identifying next steps in the research process. TRL Assessments can be used in a variety of settings to fit the needs of the institution conducting them. Having a simple mechanism to determine and communicate technology maturity improves the transition of research outcomes and program management.

The Federal Highway Administration's Exploratory Advanced Research (EAR) Program uses TRL Assessments along with other tools to help identify which research products to emphasize for transition and which audiences would be interested in the results. Dr. Ivan Bartoli of Drexel University recently completed a TRL Assessment for his EAR Program-funded project, "Multipurpose Wireless Sensors for Asset Management and Health Monitoring of Structures." The project team developed a suite of portable wireless sensors to provide important baseline data on the structural health of bridges.



A researcher monitors the computer displays of data received from wireless sensors installed on the roadway bridge during a demonstration as part of a TRL Assessment. (Source: U.S. DOT-owned)

"During the assessment, the researchers first gave an overview of the project to the TRL panel. Then they showcased the technology in the field," said Bartoli. "The researchers demonstrated the use of wireless sensors directly on an operating highway viaduct. The panelists were shown in real time the comparison of wireless and wired sensors in the field. This allowed them to judge the effectiveness and readiness of the sensors on a real application with real environmental and operational conditions rather than in more forgiving laboratory settings."

Conducting a TRL Assessment 4 to 6 months before a multiyear project is completed provides a balance between having enough results to assess and providing time for researchers to act on feedback from the assessment. Bartoli's assessment took place approximately 4 months before his project concluded. "The assessment was very helpful and constructive," he said. "Participating panelists represented the industry, departments of transportation, other government agencies, and academics. All the panelists suggested important and useful changes to the developed wireless sensing system. In particular, they made recommendations on how to modify it to deploy it across a broad range of applications. Some of the changes are being implemented."

The EAR Program has published the *Technology Readiness Level Guidebook* to provide those working in transportation research with the necessary information for conducting a TRL Assessment. The *Guidebook* explains what a TRL is and how to prepare for, conduct, and use the results of TRL Assessments. The *TRL Guidebook* is available at www.fhwa.dot.gov/advancedresearch/pubs/17047/index.cfm.

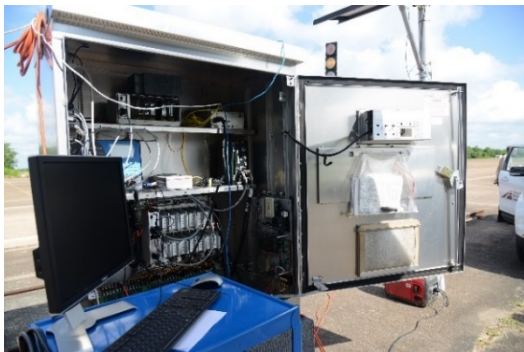
For more information, contact David Kuehn, 202-493-3414, david.kuehn@dot.gov.

EAR Program Supports Hardware-in-the-Loop Research

The Federal Highway Administration (FHWA) Exploratory Advanced Research (EAR) Program supports research using hardware-in-the-loop (HIL) technology to safely and effectively test connected and automated vehicle technologies.



Researchers for two EAR Program-supported research projects are testing connected vehicle (CV) and automated vehicle (AV) technologies using actual vehicle performance data incorporated into modeling and simulation platforms.



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Equipment captures data from connected vehicles and traffic signals on a test track during a simulation.

By providing real-time data on traffic patterns, alternate routes, and vehicle performance, CV and AV technologies will help support fuel efficiency, improve air quality, and reduce greenhouse gas emissions. However, creating simulations require realistic modeling of vehicle fuel economy and emissions in complex and changing traffic situations. Gathering accurate information about these parameters is difficult. That is what makes the HIL research so useful. The research will help engineers test CV and AV technologies under a wide range of simulated conditions.

A fact sheet about the research projects is available at <https://www.fhwa.dot.gov/advancedresearch/pubs/17044/index.cfm>.

FHWA's Office of Operations Research and Development has installed HIL technology at intersections at the Turner-Fairbank Highway Research Center (TFHRC). The EAR Program is planning a demonstration and workshop at TFHRC to share its research results and to encourage research universities to adapt the technology for additional testing at their facilities.

For more information about the HIL projects and installation of HIL technology at TFHRC, contact Peter Huang, 202-493-3484, Peter.Huang@dot.gov. For more information

about the EAR Program, contact David Kuehn, 202-493-3414, david.kuehn@dot.gov.

INFRASTRUCTURE

Benjamin Graybeal Presents as an Invited Speaker at ARPA-E Cement Workshop

Dr. Benjamin Graybeal attended the U.S. Department of Energy's Advanced Research Projects Agency – Energy (ARPA-E) Cement Workshop on April 10 and 11. The workshop explored extremely durable cementitious materials, and convened leading experts in cementitious material development, manufacturing, distribution, and end-use to identify innovations that significantly improve concrete durability and lower the energy footprint.

Ben was invited by ARPA-E to represent the highway infrastructure sector and deliver a presentation that focused on Federal Highway Administration's success with ultra-high performance concrete, an extremely durable cementitious material. Ben's presentation—Infrastructure Needs, Applications, and Pathways to Adoption—also addressed how other innovations can achieve success in the highway infrastructure sector.

There is a clear need for durable infrastructure, Ben noted, and there are many applications wherein more durable systems could be more advantageous. Ben emphasized that to address the challenge, "we must use appropriate materials as part of appropriate systems that are tailored to the anticipated environmental stressors and the anticipated service lives, and we must focus both on new construction and on the rehabilitation of existing constructed facilities."

Throughout the presentation, Ben offered advice to innovators who hope to deliver durable cementitious materials to the infrastructure sector, which included understanding the needs of the owners of the facility, offering fresh solutions to long-standing problems, developing a community of practice, and gaining and maintaining credibility within the infrastructure sector.

For more information, contact Ben Graybeal, 202-493-3122, benjamin.graybeal@dot.gov.



TFHRC Hosts Advanced Ultrasonic Weld Inspection Techniques Workshop

The Federal Highway Administration (FHWA), in cooperation with the National Steel Bridge Alliance (NSBA), hosted a workshop on advanced ultrasonic weld inspection techniques. The techniques are under investigation as a possible alternative to radiography for inspection of steel welds in bridges. The workshop, held at FHWA's Turner-Fairbank Highway Research Center in McLean, VA, on May 31 and June 1, 2018, included participation from State transportation agencies, Full Matrix Capture/Total Focusing Method (FMC/TFM) equipment manufacturers, academia, and contractors.

The workshop included a summary of FMC/TFM technology, equipment demonstrations by manufacturers, and discussions about potential bridge weld applications of the technology. Potential plans for FMC/TFM trials were discussed at the end of the workshop.

For more information, contact Hoda Azari, 202-493-3064, hoda.azari@dot.gov.

Benjamin Graybeal Receives National Leadership Award

Congratulations to Dr. Benjamin Graybeal, the recipient of Federal Highway Administration's (FHWA's) 2017 Structures Discipline Awards – Bridge Excellence Award for National Leadership.

Ben is recognized for his contributions with State departments of transportation, local agencies, consulting engineers, and contractors to advance the widespread implementation of ultra-high performance concrete connections for prefabricated bridge elements and systems as part of the Every Day Counts initiative. The National Leadership Award specifically recognizes facilitating innovation, casting vision, creating or guiding significant policy and follow-through, and developing and deploying technology.



Dr. Benjamin Graybeal (center) receives FHWA's 2017 Structures Discipline Awards – Bridge Excellence Award for National Leadership from Cheryl Richter, Director of the Office of Infrastructure Research (left) and Hari Kalla, Associate Administrator for Research, Development, and Technology (right). (Source: FHWA)

This awards program, originally established by the FHWA Bridge Leadership Council, recognizes members of the FHWA Structures Discipline who lead by example. Bridge Excellence Awards are intended to provide peer recognition for significant efforts that exemplify leadership, technical involvement, strategic planning, and innovation in the practices and methods employed by members of the FHWA Structures Discipline. The focus is not on the success of a project, but rather on what the FHWA Structures Discipline nominee did to make the project successful.

For more information, contact Ben Graybeal, 202-493-3122, benjamin.graybeal@dot.gov.

OPERATIONS

Turner-Fairbank Highway Research Center Hosts Inaugural MMITSS Development Group

The Federal Highway Administration's Turner-Fairbank Highway Research Center hosted the Multi-modal Intelligent Traffic Signal Systems (MMITSS) Development Group (MDG) meeting on May 2-3 in McLean, VA. Two additional MDG meetings are being planned.

The first meeting of the MDG was a productive one. Meeting attendees included representatives from traffic signal controller manufacturers; manufacturers of connected vehicle roadside units; manufacturers of vehicle onboard units; and academics, practitioners, and infrastructure owners. The wide range of participants gave many different, but important,



perspectives. Infrastructure owners and operators had great input related to the deployability of the technology. Device manufacturers for both roadside units and onboard units also provided their perspectives on requirements for their devices and standards necessary for interoperability. The Principal Investigator, Dr. Larry Head of the University of Arizona, reflected that the perspectives from the participating members were invaluable.

MMITSS is the next generation traffic signal system that will provide a comprehensive traffic information framework to service all modes of transportation, including general vehicles, transit, emergency vehicles, freight fleets, and pedestrians and bicyclists in a connected vehicle (CV) environment. The original prototype was developed under the auspices of the CV Pooled Fund Study, partly funded by the Intelligent Transportation Systems Joint Program Office. The goal of the current MMITSS project is to make the system deployment ready so that it can be used across the United States.

The project is scheduled to be completed in 2019. One of the biggest objectives of MMITSS is to make the product user friendly. Under the auspices of the Advanced Transportation and Congestion Management Technologies grant, smart city initiatives, and State and local agencies throughout the United States, there are many projects currently underway that use CV technology. This project will help pave the way for the agencies considering the deployment of MMITSS on their arterial networks.

For more information, contact Govind Vadakpat, 202-493-3283, g.vadakpat@dot.gov, or Deborah Curtis, 202-493-3267, Deborah.Curtis@dot.gov.

COMMUNICATIONS

TFHRC Showcases its Work at STEM Symposium

Representatives from Federal Highway Administration's Turner-Fairbank Highway Research Center (TFHRC) attended the fifth annual Science, Technology, Engineering, and Math (STEM) Symposium on Saturday, April 14, at The Nysmith School in Herndon, VA. This marks the fourth year that TFHRC attended the

event, which drew an estimated 4,000 attendees, and there are plans to attend upcoming STEM symposia.

"The experience allows us to show what we do here at Turner-Fairbank to an audience of potential engineers and their parents," said Daniel Wolfe, Marketing and Communications Specialist at TFHRC. Dan noted that business was terrific, and the success of the event would not have been possible without support from the team at TFHRC: Joe Moyer, Rick Meiningner, Lincoln Cobb, Sheila Duwaldi, Abdul Zinnedin, Osman Altan, and Tim Schmidt.

The STEM program encourages students to explore the science, technology, engineering, and math disciplines, and instead of teaching each discipline as a separate subject, STEM integrates them into a cohesive program with real-world applications.

For more information, contact Daniel Wolfe, 202-493-3186, Daniel.Wolfe@dot.gov.



Sheila Duwaldi speaks with a visitor to TFHRC's booth at the fifth annual STEM Symposium on Saturday, April 14, at The Nysmith School in Herndon, VA. (Source: FHWA)

FHWA Plans for a Busy Summer 2018

Many people take some much-needed time off during the summer, but that doesn't mean that things slow down for the Federal Highway Administration.

Here are some important events coming up during the summer months:



Early June	<p>FHWA readies two publications:</p> <ul style="list-style-type: none"> • <i>Freight Conditions and Performance Report</i> • <i>Urban Congestion Trends Report</i> 	<p>RECENT PERIODICALS <i>Public Roads—Spring 2018</i> This issue includes: Building a Bridge to Sustainability; Rolling Out Pavement Technologies; Are We Ready for Connected and Automated Vehicles; Human Mosaics Move the Nation; Ready, Willing & Able; Turning Skeptics into Adopters.</p>
Late June	<p>Federal Register will publish Notice of Funding Opportunity (NOFO) for Competitive Bridge Program. No specific date is known yet.</p>	<p>It is available online via https://www.fhwa.dot.gov/publications/publicroads/18spring/index.cfm.</p> <p>For more information, contact Lisa Shuler, lisa.a.shuler@dot.gov.</p>
June 29	<p>Anniversary of the Highway Act of 1956</p>	<p><i>Innovator: Accelerating Innovation for the American Driving Experience—May/June 2018</i></p>
July 1	<p>Deadline for West Virginia to submit its application for a BUILD grant to demolish the old, unreliable, and privately owned Bellaire Bridge near Benwood, WV.</p>	<p>This issue includes: Every Day Counts Turns the Tide in Vermont’s Road Diet Deployment; Capturing the Value of Innovation Investments; Automated Traffic Signal Performance Measures; Getting a Jumpstart on Safer Intersections; States Innovate!</p> <p>The issue is available online via https://www.fhwa.dot.gov/innovation/innovator/issue66/3dlssue/.</p>
Late July	<p>FHWA will publish web-only versions of volumes 1 and 2 of the Motorcycle Crash Causation Study (MCCS) data documents:</p> <ul style="list-style-type: none"> • <i>Motorcycle Crash Causation Study Volume 1: Data Collection Forms and Variable Naming</i> • <i>Motorcycle Crash Causation Study Volume 2: Coding Manual</i> 	<p>LINKS</p> <p>Turner-Fairbank Highway Research Center: www.fhwa.dot.gov/research/</p> <p>Resource Center: www.fhwa.dot.gov/resourcecenter/</p> <p>National Highway Institute: www.nhi.fhwa.dot.gov/home.aspx</p> <hr/> <p>Please forward this newsletter to others you think might find it interesting and/or useful. Suggestions may be submitted to: FHWA_Now@fhwa.dot.gov.</p>

