Federal Highway Administration

Research and Technology Update

March 2022 | Spring Issue

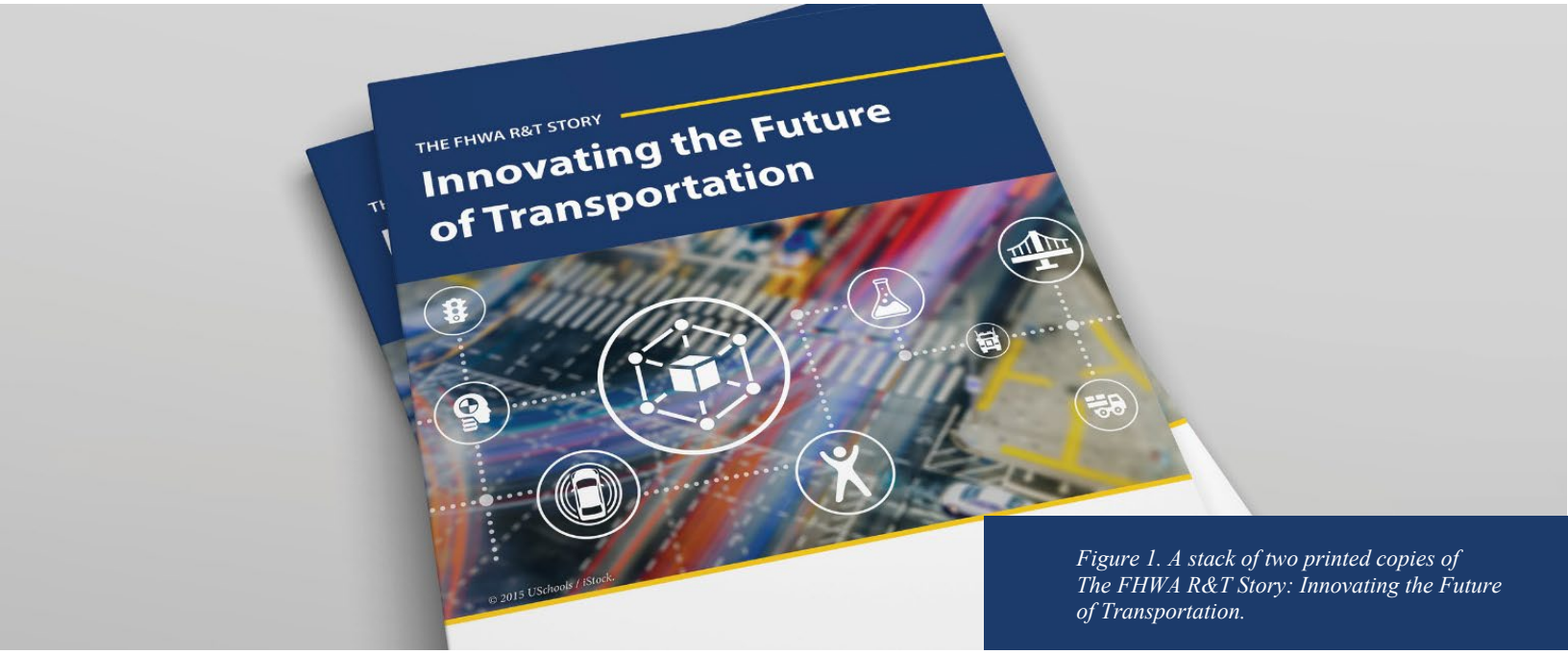


Figure 1. A stack of two printed copies of The FHWA R&T Story: Innovating the Future of Transportation.

Source: FHWA.

Federal Highway Administration (FHWA) Research and Technology (R&T) Story

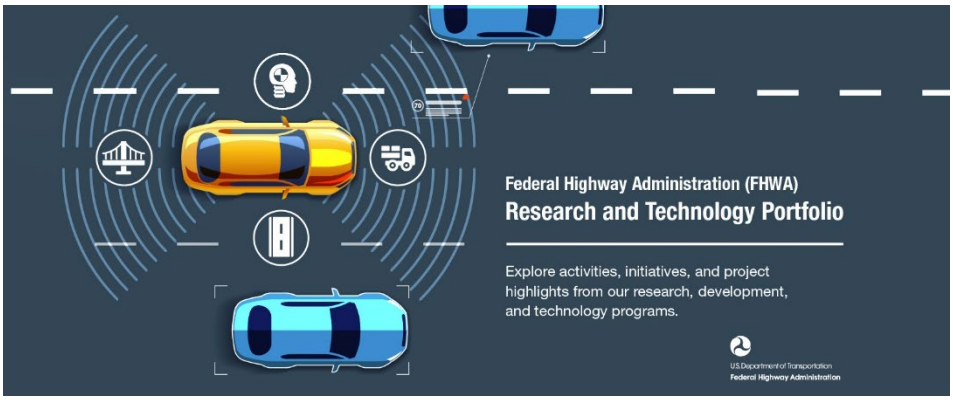
FHWA champions R&T innovations to address the critical needs of the Nation's highway system. *The FHWA R&T Story* presents innovations that ensure the safety of vulnerable pedestrians, evaluates concepts for connected and automated vehicles (CAVs), and develops better ways to test for pavement deterioration. These innovations can help renew the highway system, spur economic recovery, reduce inequities, and protect against the impact of future climate scenarios. Please visit https://highways.dot.gov/research/publications/corporate/22035.

FHWA R&T Program Portfolio

The new FHWA R&T Program Portfolio web pages provide a broad overview about FHWA's research and technology activities, initiatives, and projects. This portfolio is just a glimpse into our research and technologies. The R&T Portfolio covers the entire R&T Program, including agenda setting; research and development; technology testing and evaluation; deployment and evaluation of market-ready technologies and innovations; development of regulations and guidance; and technical assistance. Please visit https://highways.dot.gov/research/rtportfolio/home.

FHWA Works With the National Science Foundation (NSF) on Research to Assess the Benefits, Risks, and Barriers of Micromobility in Disadvantaged Communities

The FHWA Exploratory Advanced Research program, working with the Office of Human Environment, is supporting a funding supplement to an NSF award titled Making Micromobility Smarter and Safer (M2S2). The research team from Rutgers University—in cooperation with the New Jersey Department of Transportation, local agencies, and communities—is taking a novel approach to assess the benefits, risks,



Source: FHWA.

Figure 2. Illustration of the FHWA Research and Technology Portfolio (Federal Highway Administration. n.d.b).

and barriers of micromobility in disadvantaged communities, using novel approaches, including instrumented electronic scooters, mobile devices, and roadways.

Cooperative Driving Automation (CDA) Stakeholder Training

The FHWA Office of Safety and Operations Research and Development provided CARMA℠ tools, training, and technical support to the Florida Department of Transportation (FDOT) and several State universities that are interested in conducting CDA research with the FHWA suite of CARMA open-source tools. FHWA Saxton Transportation Operations Laboratory staff walked through use case exercises with FDOT and university staff to help them understand this emerging technology and in which areas they can focus their internal research to support and enable CDA in the transportation system. The two main topics requested from FDOT include pedestrian safety or vulnerable road users and arterial management, which includes work zones, incidents, and weather events.

For more information, contact Dale Thompson at dale.thompson@dot.gov or 202-493-3270.

CARMA Freight Port Drayage Testing Kickoff

The FHWA CARMA Program in partnership with the Maritime Administration, the Federal Motor Carrier Safety Administration, and the Intelligent Transportation Systems Joint Program Office has launched research to explore CDA applications to port drayage and commercial motor vehicle operations. This multifaceted project began in 2019 and will be completed in early 2022 with a closed-track field test. The primary research goal is to use CDA to improve the performance of maritime ports and terminals, along with the larger freight network. The project aims to develop and test use cases for port drayage and commercial motor vehicle operations that leverage CDA-equipped commercial vehicles to increase efficiency and safety and decrease emissions.

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

Live Broadcast of Crash Tests

The Federal Outdoor Impact Laboratory team executed another successful test, crashing a small passenger vehicle weighing 1,100 kg (2,425 lb) traveling at 30 km/h (19 mph) into a short, heavy breakaway luminaire at a 0-degree impact angle. The support broke away as designed. This test was one of a series of tests aimed at evaluating the crash performance of breakaway sign and luminaire supports and crashworthy work zone traffic control devices.

This test was conducted as part of a study of different roadside hardware. The breakaway luminaire was tested in accordance with the American Association of State Highway and Transportation Officials (AASHTO) *Manual for Assessing Safety Hardware (MASH)* testing standards at the *MASH* Test Designation 3-60 impact condition (AASHTO 2016).

For more information, contact Eduardo Arispe at eduardo.arispe@dot.gov or 202-493-3291.

Source: FHWA.

Figure 3. The luminaire support breaks away upon impact.

Testing for Eco-Drive Study

The FHWA is collecting data for the Eco-Drive study, also known as Exploring the Effects of Vehicle Automation and Cooperative Messaging on Mixed Fleet Eco-Drive Interactions study. This study is taking place at the Dominion Raceway in Thornburg, VA, and will identify driver acceptance and responses to eco-drive strategies (using infrastructure information and slowing down to reduce idle time, maintaining speed for an upcoming green light) used by a lead vehicle as it approaches a signalized intersection. This study aims to evaluate interactions between drivers, automated driving systems, and in-vehicle cooperative messages displayed at signalized intersections.

For more information, contact Jesse Eisert at jesse.eisert@dot.gov or 202-493-3284.

FHWA-HRT-21-087, *An Exploration of Pedestrian Safety Through the Integration of HSIS and Emerging Data Sources: Case Study in Charlotte, NC*, Available

The report introduces a proof of concept to spatially integrate Highway Safety Information System (HSIS) data with multijurisdictional and emerging datasets. To pilot the geospatial proof of concept, the project team developed a pedestrian count model to predict pedestrian volumes at locations without pedestrian counts and integrated speed information from probe data to supplement other roadway and contextual transportation data from several agencies. The report can be found at https://www.fhwa.dot.gov/publications/research/safety/21087/index.cfm.

For more information, contact Ana Eigen at ana.eigen@dot.gov or 202-493-3168.

Source: FHWA.

Figure 4. Image of the CARMA-HDS integration project.

Highway Driving Simulator—CARMA Integration

The Human Factors Team released the first version of the Turner-Fairbank Highway Research Center (TFHRC) Digital Twin project, the common simulation scene environment to be used as a common database between the Highway Driving Simulator (HDS) and CARMA Platform℠ tools. The CARMA Everything-in-the-Loop team has begun testing the Digital Twin scene successfully by demonstrating a simulated CARMA vehicle running in the CARMA simulation program around the TFHRC campus roads.

For more information, contact Brian Philips at brian.philips@dot.gov or 202-493-3468.

Pedestrian Dummy Test

The Human Factors Team tested advanced adult, child, and bicyclist dummies for use with automated vehicles testing at TFHRC. The team plans to use these dummies for vulnerable road user research applications.

For more information, contact Laura Mero at laura.mero@dot.gov or 202-493-3377.

Test Method for Ultra-High Performance Concrete (UHPC) Approved

As the highway community begins to engage UHPC-based solutions to address bridge design, construction, and maintenance challenges, FHWA recognized that there was a need for standardized tests to assess the engineering properties of this new generation of concrete. To address

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this need, FHWA developed the Standard Method of Test for Uniaxial Response of Ultra-High Performance Concrete. In coordination with the AASHTO Committee on Materials and Pavements, the test method, now given the designation of T 397-22, was refined and successfully balloted by AASHTO in late 2021. It will be released for public use with the next round of *Standard Specifications for Transportation Materials and Methods of Sampling and Testing, and AASHTO Provisional Standards* (AASHTO. Forthcoming).

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

Every Day Counts (EDC)-6 UHPC for Bridge Preservation and Repair

FHWA's initiative to encourage the use of innovative UHPC-based bridge preservation and repair solutions is well under way. For departments of transportations (DOTs) beginning to consider this topic area, FHWA has developed an 8-h workshop. The workshop has been delivered 10 times to different audiences around the country, and 14 more are scheduled for later in 2022. The technical leads on the initiative have also developed design and construction recommendations that will be published soon. A four-part national webinar series is also being planned to raise awareness of these promising solutions within an engaging, compelling format. Finally, agency technical experts have been providing project-specific technical assistance to early adopters across the country as they encounter the types of challenges for which information sharing and expert advice can be quite valuable.

For more information, contact Zach Haber at zachary.haber@dot.gov or 202-493-3469.

Structural Design with UHPC

FHWA is continuing to support AASHTO's interest in developing structural design guidance for the use of UHPC in primary bridge components. To advance the state of knowledge in the topic area, FHWA embarked on a major experimental research study investigating key structural performance behaviors. The effort is bearing fruit, with these five peer-reviewed journal articles having been published recently. These research findings are key to informing the structural design guidance that the AASHTO Committee on Bridges and Structures is beginning to debate.

Figure 5. The Human Factors Team testing detection of an articulated child pedestrian dummy.

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

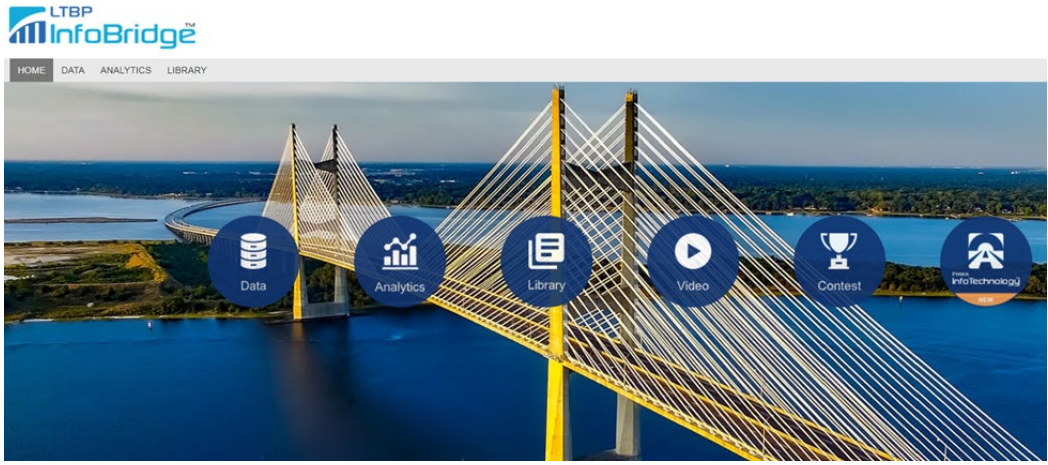
Technical Support for Scour Design of Bridge Foundations

FHWA's Hydraulics Research Program is actively fielding technical assistance requests from DOTs designing or rehabilitating scour-susceptible bridge foundations. The latest research findings are being engaged to help refine the bridge designers' understanding of predicted behaviors, thus facilitating the creation of design options anticipated to deliver the desired performance. The scour design assistance is part of Transportation Pooled Fund (TPF)-5(461) Soil and Erosion Testing Services for Bridge Scour Evaluations (NCHRP. 2022). Final design recommendations for the Michigan DOT Lafayette Bridge and Arizona DOT San Pedro Bridge replacement projects were delivered in January 2022.

For more information, contact Kornel Kerenyi at kornel.kerenyi@dot.gov or 202-493-3142.

Recent Enhancements to InfoBridge

The most recent version of InfoBridge™, released in November 2021, features several usability enhancements, including tools and projects that resulted from research performed by the Long-Term Bridge Performance Program. Highlights of some of the enhancements include an asset valuation tool, a bridge performance transition forecast, a new model on historical changes to concrete shear design, and data collected on experimental bridges. For a complete list of new InfoBridge features and enhancements, visit https://infobridge.fhwa.dot.gov/Page/infobridge_update_notes.



Source: FHWA.

Figure 6. Screenshot of FHWA InfoBridge home page (Federal Highway Administration. n.d.a).

For more information, contact Jean Nehme at jean.nehme@dot.gov or 202-493-3042.

Data Science for Pavements Symposium 2022

FHWA, in conjunction with Missouri Center for Transportation Innovation and the University of New Hampshire, hosted an international symposium on advancing data science technology in the pavement field. This symposium was held in person at TFHRC and virtually March 22–24, 2022, with 50 presented abstracts and over 160 attendees. This hybrid event focused on building foundational knowledge in data science and provided pavement engineering-related examples. Topics included terminology, supervised versus unsupervised machine learning, introductions and applications of R, data import/cleaning/preparation, visualization, and modeling The agenda included both lecture and hands-on instruction.

For more information, contact David Mensching at david.mensching@dot.gov or 202-493-3232.

Training Class on New Test for Discerning the Alkali Silica Reactivity (ASR) of Aggregates

In April, the Chemistry Laboratory will be hosting a virtual training class for more than 500 people from State DOTs, industry, and academia on the Turner-Fairbank ASR Test (T-FAST) to provide an update on recent advances. T-FAST is a chemical test that overcomes the shortcomings of existing aggregate physical tests for ASR susceptibility. The T-FAST test for coarse aggregates has been adopted as a provisional specification by AASHTO (TP 144-21) (AASHTO. 2021). The training will introduce the

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concept of measuring the alkali threshold of aggregates: that is, identifying the level of alkali that will trigger the ASR reaction for a given aggregate or mixture of aggregates. This is the first time the ability to measure the alkali threshold has been available.

State agencies, industry, academia, and testing laboratories are being invited to try the test, setting the stage for a pooled fund study and round-robin testing to advance this technology.

For more information, contact Terry Arnold at terry.arnold@dot.gov or 202-493-3305.

Forever Open Road

FHWA participated in a Forum of European Highway Research Laboratories Forever Open Road – Resilient Road element update working meeting. The group is scheduled to finish an updated draft to share at the next research coordinators meeting, which is scheduled for April. The Resilient Road is one of three elements of the Forever Open Road—the other two are the Automated Road and the Adaptable Road. The Forever Open Road document provides context for moving research toward implementation of new technologies and building opportunities for cooperation on research and pilot deployments with national road administrations or the European Commission.

Transportation Pooled Fund Excellence Award

FHWA is partnering with the AASHTO Research Advisory Committee to further promote research, innovation, and excellence through a proposed TPF Program Excellence Award. The award would be given biannually to two TPF studies that have significantly advanced national research efforts in the areas of safety, economic growth, equity, climate solutions, or transformation. The TPF Program has existed for more than 25 yr and has enabled public and private entities to combine resources to conduct high-priority research on a wide variety of shared, highway-related problems. By pooling funds and expertise, participants develop innovative solutions at a lower cost while extending the reach and impact of their research. The TPF Excellence Award would help bring additional knowledge, recognition, and support for the excellent collaborative work being done through the TPF Program. The award program is in the early stages of development; additional information, including nomination materials, will be sent out in late 2022 or early 2023.

For more information, contact Tricia Sergeson at patricia.sergeson@dot.gov or 202-493-3166.

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