Federal Highway Administration (FHWA) Update for Research and Technology Coordinating Committee (RTCC) April 2021

Leadership Changes

Peter "Pete" P. Buttigieg was confirmed by the U.S. Senate on February 2, 2021, as the next Secretary of the U.S. Department of Transportation. Secretary Buttigieg is the former mayor of South Bend, Indiana.

Stephanie Pollack was named Acting Administrator for FHWA on February 24, 2021. Deputy Administrator Pollack was most recently the Secretary and CEO of the Massachusetts Department of Transportation and served on the boards of the Massachusetts Bay Transportation Authority and Massachusetts Port Authority.

Exploratory Advanced Research (EAR) Program—New Extramural Awards

FHWA made the following four awards for proposals submitted in response to the EAR Program Fiscal Year 2020 (FY20) Broad Agency Announcement: 1) New Jersey Institute of Technology for a project titled, "Decentralized Vehicle Credential Management System Based on Consortium Blockchain," 2) Michigan Technological University for a project titled, "Autonomous Winter Road Maintenance Decision Making Enabled by Boosting Existing Transportation Data Infrastructure with Deep and Reinforcement Learning," 3) Tufts University for a project titled, "Traffic Incident Detection And Analysis System (TIDAS)," and 4) Louisiana Technical University for a project titled, "Improving the Compatibility of Waste Plastic and Asphalt Binder Via Theoretically Justified Identification of Compatible Blends." FHWA anticipates making additional awards in machine learning. For more information, contact David Kuehn at david.kuehn@dot.gov or 202-493-3414.

FHWA Participation in the National Science Foundation (NSF) National Artificial Intelligence (AI) Research Institutes' Program

The NSF National AI Research Institutes' program provides research awards of up to $20 million over 5 years to enhance fundamental research and use-inspired research in AI. The EAR Program, working with the FHWA Office of Safety and Operations Research and Development (R&D) and the Intelligent Transportation Systems/Joint Program Office, is encouraging NSF National AI Research Institutes to consider AI research for highway transportation uses. In FY20, NSF made an award titled, "Institute for Foundations of Machine Learning (ML)," which considers transportation-related uses. The University of Texas at Austin is the lead institution. For more information, visit https://ml.utexas.edu/ifml. Fiscal Year 2021 (FY21) proposals were due in December 2020. For more information, contact David Kuehn at david.kuehn@dot.gov or 202-493-3414.

FHWA working with NSF National Robotics Initiative (NRI) Program to Improve the Safety and Mobility of Vulnerable Road Users

The EAR Program, in coordination with the FHWA Office of Human Environment and the Federal Transit Administration Office of Research, Demonstration and Innovation, is coordinating with the NSF NRI Program on innovations that can improve the safety and mobility of vulnerable travelers. FHWA is seeking opportunities to support one or more FY 2021 awards that advance the safety and mobility of vulnerable travelers. FHWA support could range from providing technical assistance to supplemental funding for systems testing or technology demonstrations. For more information, contact David Kuehn at david.kuehn@dot.gov or 202-493-3414.

Revolutionary Test Method for Alkali-Silica Reaction (ASR) Gels in Concrete

After a 10-year research effort, the Turner-Fairbank Highway Research Center (TFHRC) Chemistry Laboratory has developed a new test method for determining the ASR reactivity of aggregates used in concrete. No concrete or mortar samples are needed. The method is still a work in progress, but it shows 100 percent agreement with block farm weathering data, a new achievement. A provisional test method for coarse aggregates has been presented to AASHTO for its review. Research is continuing to include fine aggregates and mitigation strategies to help in locations where only reactive aggregates are locally available. The final step in the planned research is to develop a test method that looks not at the aggregates themselves, but at the job mix formula planned for use in the concrete. For more information, contact Terry Arnold at terry.arnold@dot.gov or 202-493-3305.

Small Business Innovation Research (SBIR) Phase 2 Projects on Machine Vision-Based System to Support Connected and Automated Vehicle (CAV) Safety Applications

The two SBIR awardees, Connected Wise® and Intelligent Automation, Inc.®, are now in the latter stages of developing prototype devices that use commercial cameras and logic to interpret machine-readable, complex messages from special signage. These prototype devices would enable data to be conveyed to CAVs in rural areas where access to communication is poor or unavailable. The prototype devices also provide for visual signs to convey complex environments such as work zones or route detours. Both companies demonstrated the ability of the devices to read and capture the messages of roadway signs at highway speeds. Both projects are scheduled to be

completed later this year. For more information, contact Mohamadreza Banihashemi at mohamad.banihash@dot.gov or 202-493-3334.

Artificial Intelligence for TIDAS

The FHWA Office of Safety and Operations R&D and the staff from the EAR Program kicked off the first of three AI and ML (AI/ML) in transportation management systems projects. Tufts University was selected to conduct the TIDAS to utilize AI/ML advancements in computer vision techniques, known as ClearVision. The techniques enhance images with object detection and provide tracking of objects using neural networks, scenario detection algorithms, and a user interface to assist operators. The technology will work with existing cameras and equipment, resulting in lower implementation costs. Through innovative, AI-based use of existing roadside equipment, the project could improve image processing, improve vehicle classification, and automatically identify anomalies to regular roadway performance. For more information, contact Peter Huang at peter.huang@dot.gov or 202-493-3484.

Cellular-Vehicle-to-Everything (CV2X) Testing

The Saxton Lab team placed 24 CV2X On Board Units (CV2X OBU) in a grid pattern to simulate a congested highway of connected vehicles. This small-scale test helped the team prepare for the large-scale field test of two high-speed vehicles travelling through a field of 250 radios, all of which represented future connected vehicles crossing a large, congested intersection. For more information, contact Volker Fessmann at volker.fessmann@dot.gov or 202-493-3322.

Figure 1. CV2X Testing. (Source: FHWA.)

CARMA℠ Testing

The CARMA team has initiated testing of the self-driving features in its fleet of automated vehicles to prepare for testing and validation of the cooperative driving use cases of basic travel, work zones, and incident management. It includes weekly testing of the CARMA passenger vehicles at the Summit Point Motorsport Park in Summit Point, WV, and testing of CARMA trucks at the Aberdeen Test Center (ATC) in Aberdeen, MD. The team supported a demonstration of commercial vehicle safety features under the Federal Motor Carrier Safety Administration Automated CMV Evaluation at ATC in January 2021. For more information, contact Pavle Bujanovic at pavle.bujanovic@dot.gov or 202-493-3271.

Automated Vehicles and Analysis, Modeling, and Simulation (AMS)

The FHWA Office of Safety and Operations R&D is planning to collect data using an advanced driver assistance system (ADAS) level 2-enabled vehicle and a human-driven vehicle on roadways in Northern Virginia starting in summer 2021. The data collection will take place on an approximately 12-mile loop near the TFHRC campus. Both vehicles will be equipped with a suite of sensors to enable data collection about the adjacent vehicles in the traffic stream. The dataset will help inform the development of microsimulation models that accurately emulate the impact of level 2 ADAS technology on traffic flow and capture how human drivers alter their behavior in the presence of the technology. For more information, contact Rachel James at rachel.james@dot.gov or 202-493-3205.

FHWA Crashes into the Future

The FHWA Office of Safety and Operations R&D is working together with the National Cooperative Highway Research Program (NCHRP) to solve a general problem that occurs at many existing highway bridge locations throughout the United States. The length-of-need for guardrail required at bridge ends cannot be installed because of conflicts within the existing right-of-way limits. The conflicts may consist of an existing intersecting private driveway, State or local roadway intersection, or other objects that prohibit the placement of the required guardrail length-of-need. No current, short-radius guardrail system has been able to meet NCHRP Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH) Test Level 3 safety performance criteria for high-speed roadways.

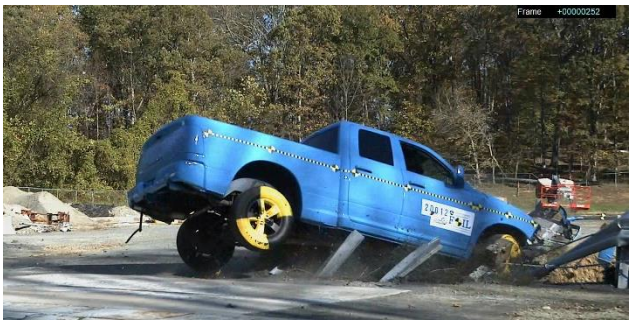

Figure 2. Full-Scale Crash Test. (Source: FHWA.)

The objective of the research is to develop guidance on barrier safety treatment alternatives near bridge ends with restricted rights-of-way in a format suitable for potential adoption and inclusion as an update to the AASHTO Roadside Design Guide.

The design, which has been finalized recently, has undergone a series of full-scale crash tests against both small cars and pickup trucks as prescribed in the MASH. It utilizes generic components from other commonly available roadside hardware to create a design that meets all the safety criteria that it was evaluated against. For more information, contact Eduardo Arispe at eduardo.arispe@dot.gov or 202-493-3291.

Second Phase of New/Novel Highway Signs to Support Infrastructure-Based Motorcycle Crash Countermeasures Study

The FHWA Office of Safety and Operations R&D completed the second phase of its study, *New/Novel Highway Signs to Support Infrastructure-Based Motorcycle Crash Countermeasures*. The *Motorcycle Crash Causation Study* was used in Phase I to determine which countermeasures should be developed for motorcycle crashes. Based on a workshop conducted by subject matter experts and motorcycle stakeholders, five infrastructure-based countermeasures were proposed for further study. Four of the countermeasures proposed were highway sign-based. In Phase II, a human-factors-highway-sign study was conducted at the Human Factors Lab with 50 human subjects to determine the most appropriate highway signs for each countermeasure. The study will benefit State DOTs in employing these highway signs as possible countermeasures to curtail motorcycle crashes. Final Report: *Novel Highway Signs Study To Support Infrastructure-Based Motorcycle Crash Countermeasures Phase II, HRT-21-010*. For more information, contact Yusuf Mohamedshah at yusuf.mohamedshah@fhwa.dot.gov or 202-493-3464.

Evaluation of Aesthetically Treated Crosswalks

FHWA has received many requests to install colored aesthetic treatments within crosswalks. When changing recognizable transportation devices such as crosswalks, however, many questions need to be answered to ensure the safety of the traveling public. The FHWA Office of Operations, Manual on Uniform Traffic Control Devices Team, and the FHWA Office of Safety and Operations R&D are collaborating on the research study Evaluation of Aesthetically Treated Crosswalks, focusing on road users' (drivers and pedestrians) recognition and behavior with rainbow color crosswalk patterns. The study will also attempt to determine the conditions or aspects of the aesthetically treated crosswalks that impact road-user recognition and behavior. The study will determine the degree to which aesthetically treated crosswalks impact road user recognition and behavior, and it will identify the particular conditions or aspects of those treatments that have the most impact. These results will also inform FHWA's future decisions on aesthetically treated crosswalks. For more information, contact Ann Do at ann.do@dot.gov or 202-493-3319.

Long-Term Bridge Performance (LTBP) Program's Data Collection Workshop

The Long-Term Infrastructure Performance Team conducted a multi-day, two-phase virtual workshop to receive technical feedback from experts in the bridge community regarding the LTBP Program's future data collection plan and activities.

The workshop included 58 subject matter experts representing State DOTs, industry, academia, and FHWA. Feedback gathered from this workshop included the how, what, and why of collecting data and the quality, quantity, and technologies used to collect data. This feedback will be used to refine and prioritize the short, intermediate, and long-term data collection needs for the LTBP Program. For more information, contact Jean Nehme at jean.nehme@dot.gov or 202-493-3042.

Highway Infrastructure Engineering Research Data

FHWA continues to produce high-quality research data and information and make them available to its stakeholders. Recently, the FHWA Office of Infrastructure R&D embarked on a multiyear effort to develop Web portals showcasing results of research efforts that are undertaken at or sponsored by the TFHRC. The following notes briefly describe each of the currently available Web portals. Direct links to the portals, brochures, and introduction videos are provided in the table below the notes.

InfoBridge™: an intuitive, user-friendly Web portal to access, visualize, and analyze bridge performance data.

InfoPave™: a powerful and flexible tool that enables users to view, visualize, extract, and employ data collected over three decades by FHWA's Long-Term Pavement Performance Program.

InfoMaterials™: a Web portal offering storage, retrieval, dissemination, and visualization capabilities for highway infrastructure research data collected through FHWA, State, and other national efforts.

Web Portals	Links to:		
InfoBridge:	Web Portal	Brochure	Intro Video
InfoPave:	Web Portal	Brochure	Intro Video
InfoMaterials:	Web Portal	Brochure	Intro Video

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

National Transportation Pooled Fund (TPF) Training

FHWA will host two National TPF training sessions: one for FHWA staff on April 19, 2021, from 1 p.m. – 2:30 p.m. EST; and a second for State DOT and other stakeholders on April 22, 2021, from 1 p.m. – 2:30 p.m. EST. The training will provide attendees an overview of the TPF program and the opportunity to discuss the administration and logistics of participating and leading TPF studies. For more information, contact Tricia Sergeson at patricia.sergeson@dot.gov or 202-493-3166.

Global Benchmarking Study on Electrically Isolated Tendons in European Transportation Structures

Post-tensioning (PT) is a method of reinforcing concrete that has greatly improved the Nation's bridges with its ability to extend span lengths, reduce concrete cracking, connect prefabricated bridge elements, and accelerate construction. Keeping check on tendon condition is vitally important to the load-carrying capacity and durability of PT bridge structures. Currently, the PT state-of-the-practice in the U.S. lacks the ability to remotely monitor in-service tendon condition and relies upon labor-intensive visual inspection. FHWA, AASHTO, and NCHRP sponsored a Global Benchmarking Program study to look at the use of electrically isolated tendons (EITs) in Italy and Switzerland with a focus on the ability of this technology to improve PT durability.

Through multiple face-to-face meetings and field visits, the study team found that Italy and Switzerland are established world leaders in the use of EITs in bridge structures. Both countries use EITs to maintain a high level of corrosion protection and provide the ability to monitor PT tendon conditions throughout a structure's intended service life. They emphasized that proper installation ensures the EIT system provides these benefits. Team recommendations for U.S. implementation include developing EIT system prequalification testing requirements, researching details to accommodate U.S. construction and inspection practices, and developing an education and outreach program for bridge designers and constructors.

The Global Benchmarking study report *Electrically Isolated Tendons in European Transportation Structures* includes details about EIT design, construction, and operation based on site visits and interviews with international experts. The team hopes the information shared in this report will inform and improve PT bridge durability and management approaches. For additional information, please contact Hana Maier at Hana.Maier@dot.gov or 202-366-6003; or Reggie Holt at Reggie.Holt@dot.gov or 202-366-4596.

Netherlands Binational Collaboration: Infrastructure Resilience-Nature-Based Solutions

Both the United States and the Netherlands face flood hazards that can damage and disrupt highway infrastructure. Therefore, both have pioneered efforts to use nature-based solutions such as marsh and dune restoration to reduce flooding and improve water quality and habitat, and both have been collaborating on infrastructure resilience since 2014.

Beginning in 2019, the collaboration has addressed nature-based engineering solutions for infrastructure resilience. Two State DOTs are participating, allowing for further testing of the approaches. Washington State DOT has innovative stormwater and stream restoration approaches that are of interest to the Dutch, and it was a valuable partner in an earlier round of collaboration. North Carolina DOT has multiple nature-based flood mitigation efforts of interest underway and reached out to take part in the collaboration.

The collaboration is structured around three main activities: Webinars, testing approaches on pilot projects, and workshops. The workshop/site visit was put on hold. The collaboration also includes monthly calls for updates and coordination. For more information, contact Jihan Noizet at jihan.noizet@dot.gov or 202-366-1153.

FHWA Developing Plan for Engaging Historically Black Colleges and Universities (HBCUs) in Research

FHWA has conducted informational interviews with faculty and staff at eight HBCUs: Hampton University, Howard University, Jackson State University, Morgan State University, North Carolina A&T University, Prairie View A&M University, Tennessee State University, and Florida A&M University – as part of an effort to increase HBCU participation in national highway research, including participation in the NRC Research Associateship Program at FHWA as well as access to research at TFHRC. For more information, contact David Kuehn at david.kuehn@dot.gov or 202-493-3414.

FHWA Working with European Laboratories on Big Data for Pavements

FHWA is collaborating with members of the Forum of European National Highway Research Laboratories on an initiative titled, "Big data for smart pavement management," or BD PAVE. It aims to apply new data methods to traditional pavement data and integrate new data such as data from probe vehicles. For more information, contact David Kuehn at david.kuehn@dot.gov or 202-493-3414.