

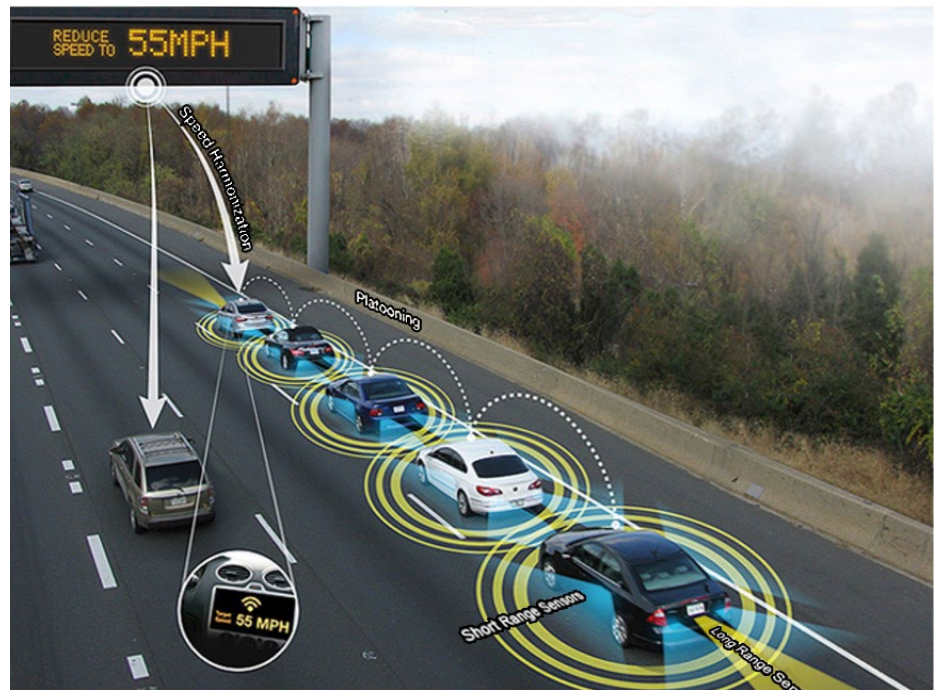
Federal Highway Administration (FHWA) Research and Technology Update Newsletter

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Traffic Optimization for Signalized Corridors (TOSCo)

The TOSCo system uses a combination of infrastructure- and vehicle-based components and applications with wireless data communications to signal TOSCo-equipped vehicles to arrive during the “green window” at specially designated signalized intersections (figure 1). TOSCo-equipped intersections continually broadcast information about the intersection’s geometry and timing of its traffic signal, and the presence of any traffic waiting in queues at the intersection.

As TOSCo-equipped vehicles enter the communication range of a TOSCo-supported intersection, the vehicles receive the geometric map, signal phase and timing, and queue information. Using these data, TOSCo-equipped vehicles then plan a speed trajectory that would allow them to either pass through the intersection without stopping (by speeding up slightly, maintaining a constant speed, or slowing down to allow the queued vehicles ahead of it to clear the intersection before it arrives), or to stop in a smooth, coordinated fashion to reduce the amount of time stopped at the intersection. TOSCo-equipped vehicles that must stop at an intersection would perform a coordinated launch maneuver at the



Source: USDOT (U.S. Department of Transportation).

Figure 1. Traffic-level simulation of TOSCo.

start of a green cycle that would allow them to clear the intersection in a more efficient manner. The green window opens at the onset of the green cycle if no queue is present or when the last vehicle in the queue has cleared the intersection when a queue is present.

Once the TOSCo-equipped vehicles leave the communication range of the intersection, they revert to their previous operating mode (manual control, adaptive, or cooperative adaptive cruise control—depending on where the TOSCo-equipped

vehicle is in the string). To view the full report, click [here](#).

For more information, contact Govind Vadakpat at g.vadakpat@dot.gov or 847-212-7590.

International Highway Engineering Exchange Program

This annual event includes State departments of transportation (DOTs), consultants, and software vendors to discuss the integration of data and other activities aimed at advancing Building Information Modeling (BIM) and digital twins.



As part of this event, FHWA organized a 4-day workshop on September 25–29, 2022 in Ft. Meyers, FL, that is an outgrowth of the Global Benchmarking Scan on BIM (Highway Engineering Exchange Program n.d.). FHWA funded travel for BIM leaders in Finland, Netherlands, Denmark, and the United Kingdom to present what they are doing. Each country was partnered with a State DOT representative who presented on what their assigned country was working on regarding that aspect of BIM.

For more information, contact Katherine Petros at katherine.petros@dot.gov or 202-493-3154

Enhancing Roadway Safety for Vulnerable Road Users (VRU) Featured in 2023 Federal Laboratory Consortium (FLC) Planner

FHWA submitted, *Enhancing Roadway Safety for Vulnerable Road Users* (Office of the Federal Register 2022). Using virtual reality, human-like pedestrian test devices, highway-driving simulators, and the Turner-Fairbank Highway Research Center's (TFHRC's) vehicle-to-pedestrian test bed, was selected out of 76 submissions to illustrate technology transfer success in the 2022 FLC planner (Federal Laboratory Consortium for Technology Transfer n.d.).

This is the fifth year in a row that TFHRC is featured in the planner. The FHWA Federal Outdoor Impact Laboratory was featured in 2019; CARMASM in 2020; ultra-high performance concrete (UHPC) in 2021; and nondestructive evaluation in 2022.

Forum of European National Research Laboratories (FEHRL) General Assembly Meeting

FHWA Associate Administrator for Research, Development, and Technology Dr. Kelly Regal represented FHWA in discussions on research collaborative efforts at the meeting that convened in Bern, Switzerland, on June 22 to June 23, 2022. FEHRL is a registered International Association based in Brussels. FEHRL provides a coordinated structure for the interests of 29 national research and technical centers from Europe and associated institutes worldwide.

For more information, contact David Kuehn at david.kuehn@dot.gov or 202-493-3414, or Jill Stark at jill.stark@dot.gov or 202-493-3470.

Travel Model Improvement Program (TMIP) Modeling and Analysis Tool

Over the past decades, transportation agencies have used predictive planning, with a predetermined plan, within a specific timeframe. However, emerging connected and autonomous vehicle technology, new mobility services, and changing travel patterns will potentially have significant unpredictable impacts on future surface transportation operations and travel demand.

The FHWA Travel Model Improvement Program (TMIP) has developed an Exploratory Modeling and Analysis Tool (EMAT). TMIP-EMAT aims to empower metropolitan planning organizations (MPO) to manage uncertainties by providing insights of potential, possible,

plausible, probable, or preferred futures. The report, *Transportation Planning for Uncertain Times - A Practical Guide to Decision Making Under Deep Uncertainty for MPOs*, is now available [here](#).

For more information, contact Sarah Sun at sarah.sun@dot.gov or 202-493-0071.

2022 Intelligent Transportation Systems (ITS) World Congress

The ITS World Congress was held in Irvine, CA, September 21–25, 2022. Staff from FHWA and other USDOT agencies were among the 10,000 attendees from across the world.

TFHRC had a very large exhibit space shared with the Federal Motor Carrier Safety Administration to showcase a CARMA truck, two CARMA vehicles, and the articulated pedestrian dummy. Several “mini-sessions” were held in the exhibit space, including a repeat of the VOICES (Virtual Open Innovation Collaborative Environment for Safety) Systems Integration Test/ Demonstration that was held at TFHRC on September 13.

TFHRC participated in several sessions and hosted a booth as well as the Cooperative Driving Automation and Automated Trucking Program Showcase in the exhibit hall.

Staff were also interviewed on human factors and VRU safety issues for ITS TV (intelligent transportation systems television) for the conference. The program may be viewed at: <https://www.itsamericaevents.com/world-congress/en-us.html>.



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

Center for Environmental Excellence Cooperative Agreement

In September 2022, FHWA awarded a 5-yr cooperative agreement to the American Association of State Highway and Transportation Officials’ (AASHTO) Center for Environmental Excellence. Under this agreement, AASHTO will continue to operate and manage the existing Center for Environmental Excellence, which provides a wide range of products and services to assist transportation agencies and industry groups in achieving environmental excellence in delivering their transportation programs, projects, and policies.

Through information sharing, technical assistance, partnership building and training resources, the Center for Environmental Excellence helps to achieve environmental compliance and adopt transformative approaches to ensure transportation planning, project development, construction, maintenance, and operations serve all transportation system users.

Also, as part of the agreement, a multiyear strategic plan will be developed that maps out the activities that the center will be undertaking and how these activities will be coordinated with FHWA and other research, development, and technology transfer activities.

For more information, contact James Gavin at james.gavin@dot.gov or 202-366-1473.

Accelerated Loading Facility (ALF)

After 36 yr of service to FHWA, the recently retired ALF has left TFHRC to be repurposed in Australia. The final component of the ALF, the 95-ft long by 12-ft wide frame, was loaded onto a truck and hauled in late October 2022 to the Port of Baltimore to start its 10,000 mile journey.

The ALF contributed to many important research studies over the years, including validation of the Superpave mix design system and, more recently, the optimization of high-recycled content asphalt mixes. FHWA will continue its accelerated pavement testing program with the recent delivery of two new accelerated transportation loading assembly machines and reconstruction of the Pavement Testing Facility test lanes.

Joint Research and Technology Coordinating Committee (RTCC) and Transit Research Analysis Committee (TRAC): Washington, DC, Nov. 30–Dec. 2, 2022

FHWA staff met with staff of RTCC, Federal Transit Administration (FTA), and TRAC to discuss FHWA and FTA research, development, and technology programs and opportunities for collaboration.

Members from both committees are drawn from the public and private

sectors and academia. Carlos Braceras, of the Utah Department of Transportation, is the incoming chairperson of the RTCC. Leslie S. Richards, of the Southeastern Pennsylvania Transportation Authority, is chair of TRAC. Topics of mutual interest such as *complete streets* and *infrastructure resiliency* were presented.

For more information, contact Jill Stark at jill.stark@dot.gov or 202-493-3470.

“Shear Design of Strain-Hardening Fiber-Reinforced Concrete Beams” Paper

FHWA’s applied engineering research program has delivered another important finding to the broader community with the publication of a paper titled, “Shear Design of Strain-Hardening Fiber-Reinforced Concrete Beams,” in the American Society of Civil Engineers’ *Journal of Structural Engineering*.

This article derives a model and associated structural design process for use in predicting the behavior of UHPC beams, columns, and other elements subjected to shear. The findings are based on physical and analytical research completed at TFHRC. These findings are currently being implemented into design guidance that is under consideration by AASHTO.

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





Source: FHWA.

Figure 2. The installation of UHPC on the Laporte Road Bridge in 2016.

UHPC Pretensioned Bridge Girders Arrive in Structures Laboratory

A new phase of FHWA’s research into the structural behavior of UHPC has begun with the first delivery of a 6-ft long pretensioned bridge girder to the TFHRC Structures Laboratory (figure 2). These girders will provide researchers with insight into the optimized elements that bridge owners anticipate using in the future.

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

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