

Proposed EDC Innovations of Interest List

1. UHPC for Bridge Maintenance and Repair

The use of ultra-high performance concrete (UHPC) in bridge design and construction has undergone significant growth over the past five years at the state DOTs; partially due to EDC's rapid deployment process. Maintenance and repair (M&R) of bridge infrastructure, an ongoing challenge for both State and local agencies, is a new application of UHPC where significant progress can be achieved. UHPC-based bridge M&R solutions offer enhanced durability and resiliency, rapid construction, and enhanced life-cycle cost performance. The proposed EDC initiative will target state and local bridge owners with a suite of UHPC-based M&R solutions.

The suite of solutions will consist of approximately six to eight concepts. Each concept will target a different bridge M&R need; examples include UHPC overlays for bridge decks, deteriorated bridge girder repair, and expansion joint repair/replacement. Some of the concepts, such as UHPC bridge deck overlays, can extend the service life of bridges well-beyond that of traditional repair strategies and are more cost competitive compared with bridge replacement. Other UHPC-based repair strategies can often be accomplished while the bridge remains in-service as opposed to traditional repairs that may require a bridge to temporarily close to service.

Over the past five years, numerous UHPC suppliers have entered the U.S. market, increasing the availability of these materials. As such, it is an opportune time to promote UHPC to a wider audience - bridge maintenance and repair professionals in state and local agencies interested in relatively low- to moderate-risk M&R applications.

2. Digital Project Delivery - Data-rich Construction 'As-Built'

At the completion of all construction projects, 'as-built' records document the actual end products so that future decisions can use the most accurate information available. As-built plans are part of this final record but as a current NCHRP synthesis study documents, most as-builts are delivered either on paper or as redlined pdfs. This limits the transfer of accurate information for post-construction decisions (e.g. asset management) and the ability to serve as a foundation for future design and construction. Traditional as-built plans can be greatly improved by leveraging geospatial collaboration, 3D models, and e-construction, which have already been proven successes through multiple rounds of Every Day Counts. Generating a model as a legal construction contract document that can be updated throughout the project helps produce digital as-built records and is a natural next step in the process of fully digital project delivery. On projects without a digital model, data captured during construction (e.g. utility locations) would provide more value if it were electronically available.

This initiative would advance technologies and processes that enable a digital delivery and creation of as-builts that meet the needs of future maintenance, operations, asset management, and design objectives. With higher quality and easily accessible digital as-builts, key project information (e.g. utilities locations) could be more accurately shared to avoid costly conflicts in the future and provide a better foundation for asset management decisions. The ability to capture the completed project in a digital format will also reduce design costs and scoping times as there will be greater knowledge and confidence in the existing conditions using the as-built information as updated through any maintenance and asset management activities.

3. Targeted Pavement Overlay Solutions for Higher Performance

Pavement overlays are a key strategy for State and Local agencies in maintaining their pavement network. Of the over 4 million miles of public roads in the U.S., 2.8 million miles are paved with either asphalt, concrete, or composite pavement systems. It is estimated more than half of all infrastructure dollars are invested in pavements and more than half of that investment is in overlays. It is essential agencies maximize the performance of overlays to ensure safe, long lasting and reliable roadways for the motoring public.

Asphalt overlay solutions include higher performing asphalt overlays such as Stone Matrix Asphalt and polymer modified mixtures and concrete solutions include bonded and unbonded concrete overlays. These overlay technologies are examples of high performing solutions that target high volume areas, intersections and bus lanes with high severity rutting, and ramps or curves with high turning movements. Targeted solutions will extend pavement service life and will reduce the need for frequent rehabilitation and subsequent work zones.

Better performing overlays will result in longer service lives on our roadway assets. This initiative will help infrastructure owners learn these new approaches, engage with peers and industry, and drive their pavement overlay program to a higher level of performance.

4. Every Day Counting for Pedestrians and Bicyclists

In 2018, 6,283 pedestrians were killed, a rise of 53% from 2009-2018, and accounted for over 17% of all roadway fatalities, the highest level in the U.S. since 1990. Identifying locations with high volumes and exposure risks for pedestrians and bicyclists is a critical step for improving safety. Notably, counting technology to monitor bicycle and pedestrian traffic is mature and available. Comprehensive count programs are under development in an increasing number of states and communities. Understanding where people are walking, and bicycling is an important step in assessing risk and safety exposure, and focusing efforts to address crashes and fatalities among nonmotorized road users.

This initiative will provide technical assistance to States and local public agencies on how to use a range of technologies and practices to conduct a systemic risk analysis based on data driven pedestrian and bicycle volume estimates using tools such as the recent "[Guide for Scalable Risk Assessment Methods for Pedestrians and Bicyclists](#)". This information will support efforts to determine crash hotspot locations and implement walking and biking safety countermeasures. For example, agencies using technologies such as emerging video-based count collection technology, which includes readily available software that captures video of key locations for bicycle and pedestrian travel, will be showcased. Also included will be technical assistance in how to integrate other innovative new data sources, such as geospatial data from emerging micromobility services, into how to better understand multimodal travel patterns on the bicycle and pedestrian networks.

In addition, this initiative will deliver comprehensive resources on trends in bicycling and walking and inform and support the efficacy of roadway treatments to enhance safety for nonmotorized travel and safer infrastructure for use of new modes of travel (including micromobility services). It will encourage States to initiate nonmotorized counting programs, employ multimodal network mapping and analysis to plan their networks, and contribute the collected data to FHWA's Traffic Monitoring and Analysis System. This initiative also supports recent recommendations by the National Transportation Safety

Board in its pedestrian and bicyclist safety research reports to advance the state of practice in measuring and estimating risk exposure for these roadway users.

5. Pedestrian Oriented Intersections (POINTS)

In 2018, 6,283 pedestrians were killed, a rise of 53% from 2009, and accounted for over 17% of all highway fatalities, the highest level since 1990. Moreover, in the past decade (2009-2018), almost 20 percent of pedestrian fatalities were located at or near an intersection. Addressing pedestrian safety at intersections is critical to reducing pedestrian injuries and fatalities. Active transportation (i.e., walking, biking, etc.) continues to be promoted as a healthy way for the public to get to places. We need to make walking safe and comfortable to support active transportation. This initiative will advance a range of countermeasures and practices to design for pedestrian safety and comfort at intersections such as: exclusive pedestrian phase, leading pedestrian interval (LPI), reduced left-turn conflict intersections (RLTCI), intersection lighting, and intersection crosswalk visibility enhancements.

6. Probabilistic Risk-based Cost Estimating

Estimating highway construction costs is difficult because they are prepared early in project development when estimates of cost and schedule are most uncertain. Consequently, there are many reports that document the challenges agencies have in accurately estimating costs of highway projects. In response to the need to develop improved estimates the FHWA conducted over 300 cost estimate reviews of Major Projects. These reviews applied a Probabilistic Risk-based Estimating (PRBE) process to the State's existing cost estimating approach. The PRBE process evaluates uncertainty using simulation to produce a reliability-based estimate of project cost and schedule completion. The findings from these reviews demonstrate the PRBE process is creating efficiencies in project delivery by reducing cost overruns.

In addition to improved reliability of cost and schedule estimates, other benefits of PRBE include:

- 1) earlier understanding of project risks,
- 2) enhanced ability to set achievable budgets and schedules,
- 3) better control of cost to optimize program budgets,
- 4) more credible ways to manage budgets and communicate risks to public and stakeholders, and
- 5) enhanced collaboration increasing project team's ability to achieve project objectives.

Even with these many benefits, implementing a probabilistic risk-based approach has been challenging due to the lack of guidance and software to conduct the analysis. Today, new training and free software is available to support the assessment and adoption of PRBE.

7. Advancing Leading Practices in Strategic Workforce Development

The complexity and pace of workforce demands in the transportation sector are accelerating and challenging Transportation Agencies and industry partners to rethink traditional workforce strategies for the recruitment, retention, and growth of the workforce they need. In concert with the American Association of State Highway and Transportation Officials (AASHTO), the Associated General Contractors of America (AGC), American Road & Transportation Builders Association (ARTBA), and U.S. Department of Labor's Employment and Training Administration (DOL/ETA), FHWA conducted a two-year pilot to explore how transportation and highway industry representatives could work collaboratively with the

nation's public workforce system to improve their ability to more effectively recruit, train and retain the highway construction workforce they need. This pilot resulted in the '[HCWP Playbook](#)' - a resource that utilizes the lessons learned from the pilot and condenses them into key considerations for partnership organizations to build off of to collaborate and establish new ways to recruit and train the workforce needed to build, maintain and operate the nation's roadways. The Playbook is supported by a comprehensive #RoadsToYourFuture campaign.

8. Next Generation TIM: Integrating Training, Data, and Technology into Arterial TIM Programs.

The 3rd Senior Executive Transportation and Public Safety Summit in November 2019 underscored the immediate need for and interest among State and local entities to apply new tools and data to improve Traffic Incident Management (TIM) programs as well as to extend TIM beyond freeway facilities. Traffic incidents put motorists' and responders' lives at risk, contribute to 50% or more delay in some regions, and strain our national economy through unreliable travel.

The EDC-2 Responder Training innovation (2013-2014) successfully trained over 100K responders mostly among State-level law enforcement and transportation agencies. The EDC-4 TIM Data innovation (2017-2018) engaged 35+ State agencies to improve their collection of TIM relevant data from crash reports, traffic management centers (TMC), and in a few cases TMC-CAD integration. Currently, in EDC round 5, Crowdsourcing for Operations, State agencies have begun using vehicle probe, mobile application, and social media data to help improve incident detection and response, which leads to less congestion and fewer secondary crashes.

With advancements in training, technologies such as unmanned aerial systems and computer-aided dispatch and data collection, State and local agencies are developing descriptive and predictive analytics to improve key components of TIM programs including safety service patrol, responder training, and move-over law compliance on freeway and arterial facilities. An EDC initiative focused on integrating technologies, training, and data, will help states integrate local agencies to combine the skills, knowledge, and assets they've built over the last few years and use them to better and more specifically target ways to improve their TIM programs on and off freeway facilities.

9. Putting Work Zones on the Map

As the nation evolves to an increasing reliance on technology and next generation transportation management, the lack of consistent, reliable data describing work zone events is hampering the ability of agencies to manage their infrastructure assets. The FHWA Work Zone Data Initiative (WZDI) improves the availability of information on **work zone events** – the “when, where, and how” of highway construction activity – by promoting standards and processes that enhance agencies capabilities to effectively manage work zone operations.

This initiative will build on the success of the WZDI innovation deployment model, through which both Iowa DOT and Maricopa County (in partnership with Arizona DOT) have deployed a data feed compliant with the Work Zone Data Exchange (WZDx) specification. Through the WZDI pilots, ten other states are actively working to deploy WZDx feeds to demonstrate applications of the data in work zone management. Accelerating deployment of this specification will help fill gaps in organizational capability such as real-time information, performance measurement, and automated vehicle readiness. Deployments of data feeds will be supported by other resources such as the **Work Zone Event Data**

Framework which describes use cases and business processes that support the data creation and its use in addressing work zone management challenges.

In addition to accelerating the Work Zone Data Initiative among States and local public agencies, this initiative has the potential to trigger the development of tools and processes by commercial vendors that would capitalize on the benefits of consistent, accurate, authoritative, standardized data to put work zone events “on the map.”