

National STIC Network Showcase 2023



Category:

Design & Construction



U.S. Department of Transportation
Federal Highway Administration



National STIC Network Showcase

The EDC-7 virtual summit, held in February 2023, included a platform for the State Transportation Innovation Councils (STICs) to showcase homegrown innovations that their members developed and implemented in their state. The purpose of this National STIC Network Showcase was to celebrate and share innovations with a wider audience to expand their potential use and impact. These innovations are saving lives, building sustainable infrastructure, growing an inclusive workforce, saving time, and making our transportation system more efficient. Over 100 innovations were shared by STIC members and are grouped into the following categories.

- Asset Management & Finance
- Maintenance & Emergency Response
- Operations
- Design & Construction
- Technology & Materials
- Planning & Environment
- Safety
- Pavement & Structures
- Civil Rights, Workforce, and Equity

This event also featured short presentations from State and local agencies on some of these homegrown innovations, which are also [available on-demand](#).

Disclaimer

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PR: PMIS and its benefits for e-construction

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SC: Strategic Deployment of Drone Technology and Software to Support SCDOT Operations

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TX: Perform Feasibility Study on Use of Innovative Tools and Techniques to Accelerate Pavement Construction

WA: Design Technology for Ultra High Performance Concrete (UHPC) Precast, Prestressed Bridge Girders

WA: Innovative Design Technology for Ultra Long Span Precast, Prestressed Concrete Bridge Girders

WA: Movable Sign Fabrication Table

WA: Spokane County Design and Fabrication of Grader Boots (Snow and Gravel)

Culvert Cleaner



OVERVIEW OF INNOVATION

The Washington County Department of Public Works had an issue with beavers setting up their dirt-filled homes inside culverts. This causes flooding that could impact the roadways. This also created a safety hazard for employees who had to risk getting bit by beavers, snakes, turtles and even leeches to enter the high waters to clear out the culverts.

The solution was a Culvert Cleaner, which was a long, steel tool that could ram inside a culvert with enough force to break up the packed dirt. The Cleaner was developed using scrap materials and Department employees (approximately 40 labor hours).



Source: Washington County Department of Public Works, New York

BENEFITS

- Effective method for clearing culverts quicker using less manpower
- Increases roadway safety from flooding during rain events. Eliminates congestion that may occur during a flood event.
- Improves safety for workers tasked with clearing culverts during a flood event.

FIND OUT MORE . . .

https://www.fhwa.dot.gov/clas/babm/babm_winners.aspx

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Keywords: Culvert; Flooding; Roads; New York; Innovation

Extending Centerline Marking Life



OVERVIEW OF INNOVATION

Schweitzer Mountain Road in the Independent Highway District (IHD), Idaho gets anywhere from 100 to 300 inches of snow annually. Maintenance crews plow the road multiple times per day, which results in the scraping away of pavement markings. The reduction in visibility presented a safety hazard for drivers and for snowplow teams trying to get up and down the well-traveled route to the local ski area.

The Independent Highway District developed the Recessed Lane Indicator. The process involves making indentations or divots along the roadway's centerline using metal plates and then covering them with thermoplastic markings that can remain visible for up to 10 years.

Initial cost to implement innovation was \$940 for materials and labor.



Source: Independent Highway District, Idaho

BENEFITS

- Increased safety for drivers
- Less spending for road maintenance

FIND OUT MORE . . .

https://www.fhwa.dot.gov/clas/pdfs/2021_mousetrap_entries_booklet.pdf

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Keywords: Centerline Markings; Road Maintenance; Pavement; Divots; Snow; Safety

Unlocking Building Information Modeling (BIM) for Bridges with the BIM Execution Plan



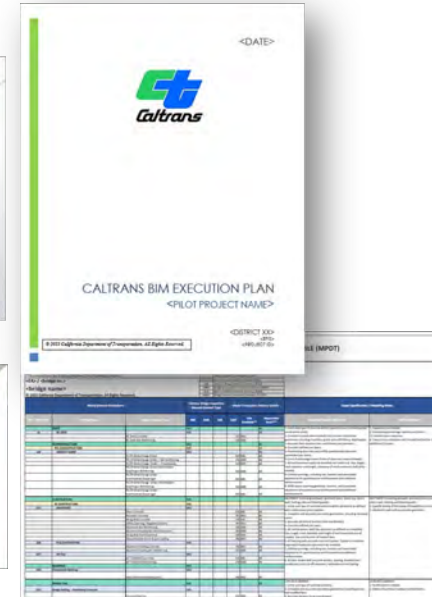
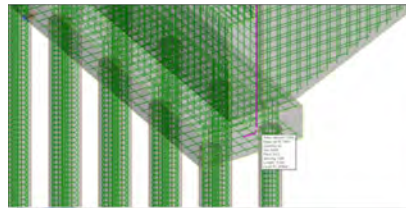
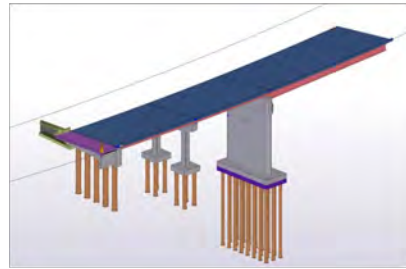
OVERVIEW OF INNOVATION

Federal Highway Administration (FHWA) calls the BIM Execution Plan (BEP) “critical to the success of BIM for infrastructure implementation¹”

To unlock BIM’s powerful digital data structures and visualization capabilities, California Department of Transportation (Caltrans) identified the need for a BEP Template that would align its information modeling requirements and govern its information management. The Caltrans BEP Template is based on the ISO 19650 standard and has established a framework to apply a consistent approach to several different bridge types, while accelerating the organization’s understanding of BIM for bridges in pilot projects.

Bridge Design is collaborating with Roadway Design, Construction, Maintenance, and other functional units to enable improvements in the way public bridges and structures in California are planned, designed, constructed, and maintained to benefit California taxpayers and stakeholders.

¹Ref: Federal Highway Administration, Advancing BIM for Infrastructure: National Strategic Roadmap (Washington, DC: 2021) <https://doi.org/10.21949/1521637>. Page 23



Source: Caltrans BIM for Bridges & Structures Committee

BENEFITS

The BIM Execution Plan (BEP) Template sets-up an information management framework for BIM that is consistent with ISO 19650. An Assessment of 11 UK Case Studies² found that “the use of Information Management (IM) could potentially secure ... \$8.50 in direct cost savings for every \$1 invested in IM.” Currently Caltrans is piloting the BEP in ten pilot projects.

²KPMG, The value of Information Management in the construction and infrastructure sector (UK: 2021) https://www.cdbb.cam.ac.uk/files/cdbb_econ_value_of_im_report.pdf. Page 5
Values are converted from GBP to USD

FIND OUT MORE . . .

Caltrans Innovation Expo Day 5: November 20, 2020. Unlocking BIM for Bridges & Structures: <https://www.youtube.com/watch?v=2jxN4nMNQGE>

“Developing a Strategic Roadmap for Caltrans implementation of Virtual Design/Construction/Civil Integrated Management” <https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/final-reports/ca20-3178-finalreport-a11y.pdf>

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Design, Structures

District 11 San Diego: South County Trade Corridors State Route 11 Enrico Fermi Diverging Diamond Interchange



OVERVIEW OF INNOVATION

Starting with policy and planning, multimodal considerations, safety, operational characteristics, geometric design, and completed construction and maintenance, The State Route 11 Enrico Fermi Diverging Diamond Interchange features an unconventional and innovative Diverging Diamond Interchange design.

As part of a larger purpose and transportation system in this corridor, this Enrico Fermi Diverging Diamond Interchange (DDI) will satisfy the increasing demand for California-Mexico trade at existing border crossings.

The efficient delivery of goods and services is critical to the customer's satisfaction – the success of individual businesses and the urban and global economies. Yet to reach the destination, goods distributors face significant challenges across urban and metropolitan environments, regional highway networks, and bottlenecked ports.

This Diverging Diamond Interchange design facilitates the most efficient traffic patterns from Mexico into the United States. Access to border wait times at the different Ports of Entry will reduce congestion and positively impacts the air quality of moving travelers and goods throughout the country.



Caltrans D11

BENEFITS

- Traffic patterns promoted by the DDI will facilitate continuous movement from Mexico into the California State Transportation System, helping to reduce the air quality impact created by the movement of goods and the traveling public.
- The novel DDI design also promotes intersection safety for pedestrians and bikers while meeting the conflicting demands for increasing capacity, decreasing congestion, and minimizing the cost of multiple infrastructures.

FIND OUT MORE . . .

2021 District 11 Innovation Fair

<https://youtu.be/OigDMS6pKqo>

Keep San Diego Moving
– State Route 11 Corridor

<https://www.keepsandiegomoving.com/SR-11-Corridor/SR11-intro.aspx>

Caltrans Innovation EXPO 2022

<https://caltrans-innovation-expo.constantcontactsites.com/enrico-fermi-diverging-diamond-interchange-with-border-wait-time-technologies>

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Equity, Operations, Planning, Environment,
Structures, Design, Freight/Goods Movement

DISTRICT 11

Wrong Way Driver Offramp Enhancement Package



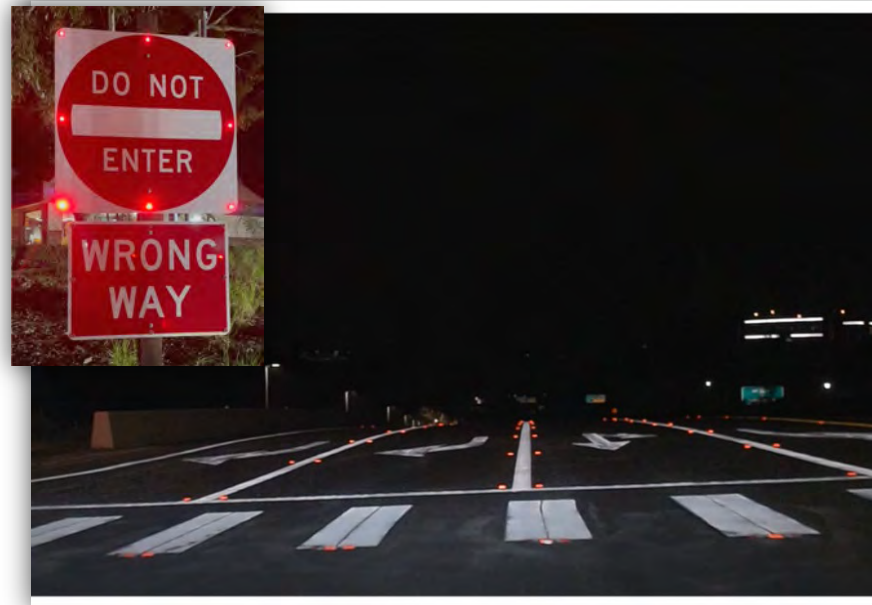
OVERVIEW OF INNOVATION

District 11 took the lead for the wrong-way prevention pilot project initiated after a series of Wrong Way (WW) collisions in 2015 in the San Diego and Sacramento regions that had resulted in several fatalities.

This pilot focused on three areas of enhancement measures:

- Replace traditional one-way markers on exit ramps with red-clear retroreflective markers on lane & channelizing lines. Install red-yellow retroreflective markers along the left edge line and one-way red retroreflective markers along the sides of Type V (through) arrows. In addition, add dashed yellow extension lines to guide motorists to the entrance ramp when it is adjacent to an exit ramp.
- Place additional retroreflective markers on edge lines. With the left edge line, we decreased the spacing of the red-yellow retroreflective markers in the first 480' from the exit terminus. With the right edge line, we reduced the spacing of the one-way red retroreflective markers for 360' starting 120' from the exit terminus.
- Install Blinking LED bordered Wrong Way signs with a wrong way detection system or 24/7 operation.

The pilot project was successful and is currently part of the Caltrans standard wrong-way package at freeway exit ramps.



District 11

BENEFITS

- Red retroreflective pavement markers (backside) resulted in a 44% to 64% reduction in reported wrong way events.
- Blinking LED wrong way signs resulted in a 60% reduction in reported wrong way events

FIND OUT MORE . . .

Wrong Way Pilot Projects

[Wrong Way Pilot Projects | Caltrans](#)

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Safety, Operations, Design,
Construction, Maintenance,
Planning, Equity

Low-Cost Flood Sensors



OVERVIEW OF INNOVATION

- Sensors are used to evaluate roadway conditions and advise the public when water hazards are present (public can sign up for electronic notifications).
- Devices are deployed quickly and effectively to provide reliable data.
- Due to cost effectiveness of equipment and data collected, DelDOT is looking to further enhance the network of monitoring across the state for quick and accurate notification to the public of flooded roadway dangers.
- Recently approved STIC funding will further refine this innovation to develop and test more robust sensor designs and develop two-way communications capabilities to allow remote access functionality.



DelDOT

BENEFITS

- Durable and cost-effective technology for consistent data gathering.
- Integration of water data with roadway elevations to alert motorists of flooding concerns quickly and accurately.

FIND OUT MORE . . .

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Flooding, sensors

Intersection Lighting Retrofits: Improving Existing Street Lighting for Crosswalk Safety



OVERVIEW OF INNOVATION

Florida DOT has a unique, systemic program to upgrade existing intersection lighting to increase safety at crosswalks, known as “Intersection Lighting Retrofits.” Sufficient intersection lighting is proven to reduce nighttime pedestrian crashes by over 40%.¹

After a multi-year program, FDOT has now installed “Intersection Lighting Retrofits” at over 1,800 intersections. This is the result of a strategic initiative to improve the lighting of pedestrian crosswalks at over 2,500 signalized intersections by 2024.

In general, these retrofit operations include switching old lamps to new LED technology in order to meet the FDOT’s own vertical illumination criteria. Additionally, new light poles or fixture mounting arms may be added among existing structures to improve the directionality of light projected on pedestrians.

Prior to launching this retrofit program, FDOT developed the policy and lighting criteria to define an “Intersection Lighting Retrofit” operation and achieve positive contrast of pedestrians in crosswalks as recommended by AASHTO and the Illuminating Engineering Society (IES). Positive contrast is generally found by placing streetlights between crosswalks and approaching vehicles, thereby illuminating the front of pedestrians from the driver’s perspective. This helps approaching drivers to better see pedestrians and avoid crosswalk collisions.

1. “Handbook of Road Safety Measures.” Elvik & Vaa, Oxford, United Kingdom, Elsevier



Source: FDOT Research BDV25-977-60

BENEFITS

Intersection Lighting Retrofits allow for:

- Lower cost lighting improvements at signalized intersections as existing structures do not require removal or rebuilding
- Greater numbers of signalized intersections with vertical illumination design and positive contrast for pedestrian lighting
- Improved nighttime driver visibility and pedestrian safety at signalized intersection crosswalks

FIND OUT MORE . . .

FHWA Video:

<https://www.youtube.com/watch?v=E0A6Ha5eQmo>

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Keywords: Light, Streetlight, Intersection, Crosswalk, Safety, Environment, Design

LED Luminary Glare Shield Improves Visibility for Motorists



OVERVIEW OF INNOVATION

William “Bill” McGhee, the FDOT District 5 Field Maintenance Manager, was presented with the Secretary’s Innovation & Efficiency Award for his display of innovation and commitment to safety. When a concern was identified regarding 149 LED luminaries creating glares for motorists on the U.S. 17-92 bridge over the St. John’s River in Debarry, Florida, McGhee went to work and developed a solution. He designed 12 light shields out of sheet metal for the luminaries that light up the multi-use path along the bridge, improving visibility for motorists without sacrificing visibility for pedestrians or bicyclists. McGhee even dipped the shields in liquid rubber to remove any sharp edges to prevent possible injury.

Creating and installing these shields in-house are also a cost savings for FDOT. If the remaining 137 luminaries were contracted, the cost to the agency would be near \$50,000.

BENEFITS

Safely light the multi-use path along the bridge, removing glare for motorists.

Near \$50,000 savings to the Department by performing in-house.

FIND OUT MORE . . .

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Luminaries, lighting, maintenance,
environment, design, safety

ZICLA Zipper System on Oakridge Boulevard (SR 430)



OVERVIEW OF INNOVATION

This project implemented safety improvements on Oakridge Boulevard (State Road (S.R.) 430) from the east side of the Halifax River to S.R. A1A. The roadway was repurposed by reducing the number of travel lanes from three to two and creating a 7-foot-wide, green, buffered bicycle lane.

As part of this project, the Department introduced the innovative ZICLA Zipper bicycle buffering system, which is the first of its kind to be used in an FDOT construction project. The ZICLA Zipper system is a series of reflective, raised separators designed to protect cyclists and prevent motorists from entering the bike lane. The ZICLA Zipper is widely used in Spain and provides real and perceived safety benefits to cyclists. They are highly visible because 50% of the surface is retroreflective.

Other improvements include a dedicated left-turn lane from Oakridge Boulevard onto Halifax Avenue, repaving Oakridge Boulevard to extend the life of the existing roadway, and landscaping enhancements. Additional pedestrian and bicycle improvements are also included in the project such as upgrading existing sidewalks and adding a bicycle lane transition at Grandview Avenue. A bicycle lane transition provides a place where bicyclists can safely and easily access the sidewalk from the bicycle lane.



Source: FDOT

BENEFITS

- Improved safety for bicyclists
- Improved non-motorized travel options
- Enhanced corridor aesthetics

FIND OUT MORE . . .

Project website -

<https://www.cflroads.com/project/441139-1>

ZICLA website -

<https://www.zicla.com/en/zipper/>

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Keywords

ZICLA Zipper bicycle buffering system, lane repurposing , safety, environment, design

Barricade Trailer



OVERVIEW OF INNOVATION

A smarter trailer design makes placing, removing, and transporting traffic safety equipment and accessories safer and more efficient.

When barricades, cones, sandbags, and other traffic safety equipment are needed, quick and efficient placement is critical. Not only do these devices protect drivers by alerting them to potential hazards in the roadway, but extended exposure to traffic can put workers and all road users at greater risk.

Cherokee County's previous transport system carried barricades upside-down, requiring two workers to physically flip the devices to place them on the roadway. Space for other necessities, such as barricade legs, fence posts, and signs, was also limited and increased the amount of time and trips required to complete the work.

To make the process faster and more efficient, agency staff designed and built a trailer with a better configuration. The trailer transports barricades upright, making it less strenuous for workers to load and unload. It can also accommodate more of the other essentials that are often needed at a site, including fencing, posts, cones, and approximately 80 filled sandbags.



Source: Cherokee County Secondary Roads

BENEFITS

This trailer design is more efficient, decreasing the amount of time required to place or removed traffic safety equipment. This reduces workers' exposure to traffic and ensures the traveling public are alerted to roadway hazards more quickly.

The new design also accommodates more equipment, reducing the amount of time required to set up or remove a closure.

FIND OUT MORE . . .

Innovation Video

<https://youtu.be/COUva7i10QE>

Cherokee County Secondary Roads Website

https://www.cherokeecounty.iowa.gov/departments/offices_a_-_e/engineer/index.php

Iowa Local Technical Assistance Program

<https://iowaltap.iastate.edu/>

Cherokee County Secondary Roads

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Safety, Construction, Maintenance, Emergency Response, Emergency Relief

Flood Resiliency Analysis Tool



OVERVIEW OF INNOVATION

A methodological framework helps Iowa DOT identify the roads most vulnerable to extreme flood events and prioritize the state's investments.

As severe floods in Iowa become more frequent, catastrophic, and costly, understanding the risks to the state's infrastructure and preparing for changing conditions can make a big difference in how quickly the state recovers from potential disruptions.

In 2021, the Iowa DOT asked its Resiliency Working Group to develop a flood resiliency methodology that could be integrated into the agency's decision-making process and long-range planning activities. The group conducted a review of the state's primary highway system, identifying the corridors at greatest risk of extreme flooding and developing a methodology to objectively determine where mitigation efforts and investments would be most beneficial.

By considering seven weighted factors, Iowa DOT engineers can give each of the state's key highway segments a composite score up to 100. The higher the score, the greater the corridor's resiliency in the event of a 100-year flood.



Source: Iowa DOT

BENEFITS

Understanding the risks to the state's highways can help Iowa DOT plan for and invest in appropriate mitigation measures that minimize transportation-related disruptions in the event of a severe flood.

The metrics and framework used in Iowa's resiliency analysis tool can be easily replicated or adapted by other transportation agencies.

FIND OUT MORE . . .

Iowa DOT Resiliency Working Group
<https://iowadot.gov/sustainabilityandresiliency/Up-Close-Resiliency-Working-Group#53947672-i-classfa-fa-map-aria-hiddentruei-our-strategies>

Iowa DOT Resiliency Working Group

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Planning, Structures, Asset Management,
Emergency Response, Emergency Relief,
Stormwater Management

Public Involvement Management Application



OVERVIEW OF INNOVATION

A powerful virtual tool facilitates management and coordination of public engagement and agency communications for thousands of active and completed transportation projects.

Across the state, Iowa DOT manages approximately 4,000 active transportation projects at any given time. However, the agency only has two staff members devoted to coordinating public and stakeholder involvement throughout the development and construction process.

To provide its Public Involvement staff with the right tools for this important work, Iowa DOT developed the Public Involvement Management Application, or PIMA, in 2015 to manage registrations for public meetings. Since that time the app has expanded to also manage stakeholder contact information, track project feedback and agency responses, collect and report project-specific data and analytics, and more.

Iowa DOT is part of multi-state PIMA consortium that also includes Maine, Wisconsin, Massachusetts, and Texas. Representatives from these states meet monthly to discuss the app's usage and potential improvements. The consortium's no-cost sharing agreement gives member states full access to all updates and improvements while allowing each state to implement the features that support their particular needs and stakeholders.

SHARE YOUR FEEDBACK ON PROJECTS & STUDIES

We are committed to improving our transportation system through your participation and feedback. Public hearings, meetings, and notices allow you to take part in the planning process and help you better understand the highway projects and studies that affect your community. We provide auto-translation tools on this website if you have limited English skills. Iowa DOT does not guarantee the accuracy of auto-translation tools. For more information, see the disclaimer below. If you need more help, please email the project contact listed on each project web page.

SEARCH PROJECTS & STUDIES

Search the site for project information, handouts and materials. Includes both current and historical project info.

MAP SEARCH

Find any active project or study on our interactive map. Share your thoughts and view feedback.



Source: Iowa DOT

BENEFITS

PIMA gives a two-person staff the power to successfully manage details and communications regarding thousands of transportation projects across Iowa. By sharing the costs and benefits of developing and maintaining the application, the multi-state PIMA consortium maximizes the app's potential. Recent and in-progress improvements include a dashboard that shows the equity of transportation projects as well as an extension that allows access via cell phone.

FIND OUT MORE . . .

Iowa DOT's Public Involvement Website
<https://www.news.iowadot.gov/pim/>

YouTube Video
<https://www.youtube.com/watch?v=9oeQ1td5ORs>

FHWA's *Innovator* Newsletter Article
https://www.fhwa.dot.gov/innovation/innovator/issue80/page_05.html

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Planning, Technology, Equity, Design,
Construction



Construction Partnering and Work Zone Safety

OVERVIEW OF INNOVATION

When a state's Department of Transportation adopts a new practice for construction partnering or work zone safety, it is often not shared with other state DOTs. So, to ensure that the newly adopted practices and their benefits are shared, The Idaho Transportation Department Led a 5-State peer exchange in 2021.

At the peer exchange, state DOT employees from Idaho, Arizona, Nevada, Utah, and Washington State, along with employees from the Federal Highway Administration, were able to share new practices regarding construction partnering and work zone safety.



Source: The Idaho Transportation Department

BENEFITS

Though interstate collaboration, this innovation increased work zone safety and construction partnering efficiency.

FIND OUT MORE . . .

[Peer Exchange Event Program](#)

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Safety, Partnering, Construction



Heated Hot Mix Splitting Table

OVERVIEW OF INNOVATION

When testing a cylindrical cut of hot mix, two samples must be split from opposite sides of the mix. On a stationary table, this process can be cumbersome because the hot mix must be manually rotated, or the technician must maneuver to reach the other side of the cut. Aside from making the process more difficult, using a stationary table also increases the likelihood that the cut is segregated during the splitting process.

To address these issues, ITD employees created a hot mix splitting table that rotates to allow for greater accuracy and ease of use. This not only saves a considerable amount of time, but it increases the likelihood that the splitting process is homogeneous.



Source: The Idaho Transportation Department

BENEFITS

The Heated Hot Mix Splitting Table reduces the time and effort it takes to split hot mix samples.

FIND OUT MORE . . .

N/A

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Testing, Hot Mix, Efficiency, Pavement, Quality,
Time-Savings



Mobile Eyewash Station Attachable to Striping Trucks

OVERVIEW OF INNOVATION

After witnessing a pavement-marking contractor get splashed in the face with striping paint, three ITD employees decided to take it upon themselves to engineer a mobile eye washing station that is mountable to existing striping trucks.

Prior to this innovation, contractors would splash water in their face to wash off paint. Aside from sanitation concerns, water was not always available to contractors to use.

This innovation addressed both of those issues by being mountable to existing striping trucks. Furthermore, to reduce the eye washing station's install time, the station utilizes the water supply and pump already onboard the striping trucks.



Source: The Idaho Transportation Department

BENEFITS

The primary benefit of this innovation is increased access to critical safety equipment used to wash potentially harmful substances out of worker's eyes.

FIND OUT MORE . . .

N/A

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Safety, Eyewash, Striping, Trucks



Temporary Traffic Signal with Bicyclist Button

OVERVIEW OF INNOVATION

Temporary traffic signals are often used in work zones where only direction of traffic can move at a time. However, though these signals work well for vehicles, they often neglect other road users such as bicyclists and pedestrians.

To address this issue in a work zone along a popular biking route, ITD employees decided to use a temporary traffic signal with a button that allows bicyclists and pedestrians to safely move through the work zone.

This innovation not only increased safety for all road users, but it addressed equity issues by allowing those not in vehicles to navigate through the work zone.



Source: The Idaho Transportation Department

BENEFITS

By employing a temporary traffic signal with a bicyclist button, ITD was able to increase safety for all road users and address equity issues by allowing those not in vehicles to navigate through the work zone.

FIND OUT MORE . . .

[Justification for the Innovation](#)

[Render of the Signal in Use](#)

[Diagram of the Signal](#)

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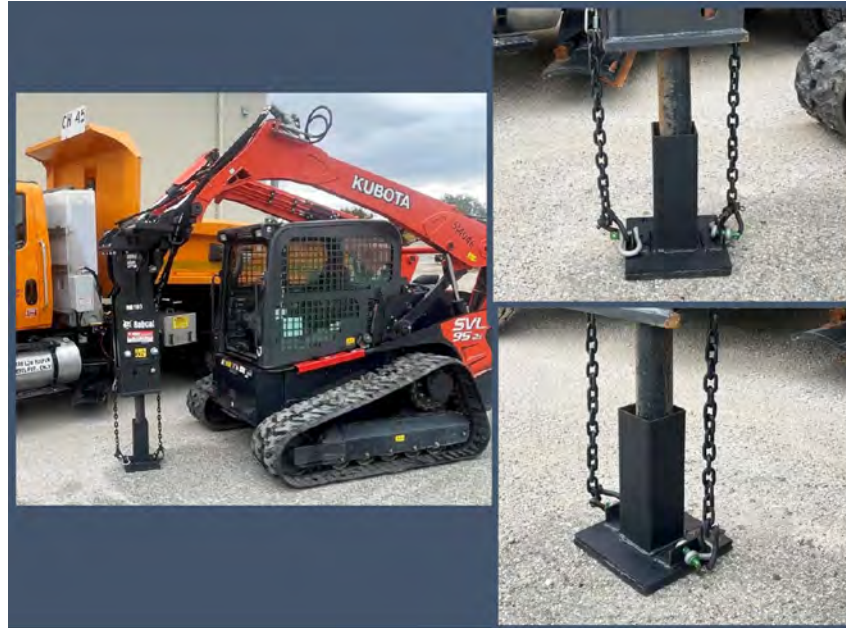
Safety, Equity, Mobility, Bicyclist, Signal

Tamp Plate

OVERVIEW OF INNOVATION

After disturbing road underlayment for a full-depth patch, achieving optimal compaction may be difficult. The width of the patch is often too narrow to allow the rolling compactor to be useful, and jumping jack tamps provide just 325 foot-pounds of force, making them less than ideal for the job at hand. When compaction is insufficient, the patch may sink and require further repairs.

A new tamp was developed that freely and safely attaches to the end of the skid steer breaker, transforming it into a 12-inch by 12-inch plate compactor. Harnessing up to 1,500 foot-pounds of force, the tamp plate was created by combining two plates with nuts, bolts, welded D rings, chains and a locking chain link. With the chains cut to length and connected via the locking link, the compactor safely attaches to the machine and moves up and down without restriction. The breaker tip compresses as if it were going through concrete, but the plate absorbs the force and distributes it evenly to the ground, causing more than enough compaction to ensure proper ground preparation for repairs.



Illinois Department of Transportation

BENEFITS

The compaction provided by the new tamp plate improves performance of a patch. The tamp plate quickly and easily attaches to the skid steer through chains with locking links. Building the tamp plate takes less than one day and can be easily replicated by other yards with minimal expense.

FIND OUT MORE . . .

Illinois Department of Transportation

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Keywords – tamp plate, patching, compaction

Asphalt Smoothing Rake



OVERVIEW OF INNOVATION

The Athens crew fashioned this asphalt smoothing rake out of used plow blades bolted together. It connects to the sides of an excavator bucket and does a great job smoothing asphalt over jobs like culvert replacements with 16-20' openings. Two people can lift the rake onto a truck for transport to the job site.

The crew notes that the brackets should be installed at the width to match the excavator bucket to which it will be attached. Also, chains could be added to the bracket sides for stability if the rake were to be used for back-dragging material.



Photo by MaineDOT

BENEFITS

This tool utilizes repurposed plow blades to make fast and painless work of smoothing asphalt compared with raking by hand.

FIND OUT MORE . . .

Gary Ritter

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Maintenance, Construction, Safety

Culvert Banding Tool



OVERVIEW OF INNOVATION

This banding tool is designed to join culvert collars when the coupler bolts are too short to reach. This tool saves time over the traditional method of winding nuts on threaded rod to reach the coupler bolts. Multiple tools recommended for easiest banding.



Photo by MaineDOT

BENEFITS

This tool makes fast work of banding two culvert sections together in the field, saving both time and physical muscling of sections to join.

FIND OUT MORE . . .

Measurement drawing and additional photos available to facilitate replication. Contact MaineDOTInnovates@maine.gov.

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Maintenance, Construction

Harris Inspection Tool (aka HIT Rod)



OVERVIEW OF INNOVATION

MaineDOT Bridge Inspection team leaders and twin brothers Scott and Steve Harris have invented a variation of a selfie stick to enable a phone camera to visually inspect bridge elements that otherwise would require expensive equipment and often traffic control.

The telescoping HIT Rod consists of a 20' telescoping pole with an attached adjustable phone cradle on top. The iPhone's camera is remotely controlled by an Apple watch. MaineDOT Inspection Teams use iPhones and Apple watches, but other phone brands and compatible pairings may work.

The iPhone's camera is activated from the Apple watch via Bluetooth and the preview is actively cloned to the watch display. The iPhone is then moved into position via the HIT rod and the iPhone's picture is snapped remotely from a button on the watch. The Apple watch can also remotely adjust the iPhone Zoom, Flash, Timer, and other functions.

All MaineDOT Team Leaders are issued iPhones by MaineDOT. The additional cost of the HIT Rod for each inspection team is approximately \$800 – the cost of the Apple watch, telescoping pole and phone holder.

The HIT Rod is only used in areas where visual inspections are deemed appropriate by MaineDOT. The use of the HIT Rod often identifies areas requiring advanced inspection techniques.



Photo by MaineDOT

BENEFITS

Up to \$5000/inspection is saved by using the HIT Rod rather than paying for heavy equipment and/or traffic control. Few innovations have this strong a return on investment.

FIND OUT MORE . . .

Demonstration video is posted on MaineDOT Sharepoint site. Contact MaineDOTInnovates@maine.gov for access credentials to view.

Steve Harris

Bridge Inspection Team Leader

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Maintenance, Technology, Safety, Structures

Synthesis of National Best Practices on Pedestrian and Bicycle Design, Guidance, and Technology Innovations



OVERVIEW OF INNOVATION

Ensuring nonmotorized road users are considered and safeguarded at every opportunity through best practices in infrastructure design and transportation management.

In 2021, bicyclists and pedestrians made up about 19 percent of all traffic fatalities in Michigan. Making roadways safer for all users will help the Michigan Department of Transportation (MDOT) achieve our goal of Toward Zero Deaths (TZD).

To improve pedestrian and bicyclist design practices statewide, MDOT gathered input from experts and advocacy groups and a thorough evaluation of the cutting-edge strategies and design innovations that have been implemented nationwide.

These efforts produced best practice guidance to help MDOT consider pedestrians and bicyclists across all aspects of transportation design. Ultimately, this information was used to identify elements within department guidance documents related to transportation planning or design where consideration for nonmotorized road users could be integrated or enhanced.

Additional materials were developed or revised to provide further guidance toward the use of pedestrian and bicycle strategies in Michigan. This included an update to **MDOT's Best Design Practices for Walking and Bicycling in Michigan** as well as the development of a new document entitled **Tools for the Planning and Design of Pedestrian Crossing Enhancements**.



Source: Michigan DOT

BENEFITS

With a new guidance document, MDOT is better prepared to protect pedestrians and bicyclists across the state with safer roads, sidewalks and paths.

FIND OUT MORE . . .

Research Spotlight Brief:

<https://www.Michigan.gov/MDOT/-/Media/Project/Websites/MDOT/Programs/Research-Administration/Research-Spotlights/SPR-1708-Spotlight.pdf>

Final Report:

<https://www.Michigan.gov/MDOT/-/Media/Project/Websites/MDOT/Programs/Research-Administration/Final-Reports/SPR-1708-Report.pdf>

Tools for the Planning and Design of Pedestrian Crossing Enhancements:

<https://mdotjboss.state.mi.us/TSSD/getTSDDocument.htm?docGuid=07f97844-60a2-49a8-87a0-5d02582e43bb&fileName=Tools%20for%20the%20Planning%20and%20Design%20of%20Pedestrian%20Crossing%20Enhancements%202022.pdf>

Michigan Department of Transportation

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Design, Safety, Pedestrians, Bicyclists

Contracting Risk Management Best Practices



OVERVIEW OF INNOVATION

Incorporating best practices from transportation agencies across the country, the Michigan Department of Transportation's (MDOT) Innovative Contracting program developed a new set of customized tools, documents and other resources in one user-friendly workbook to help identify, document, and manage risks more effectively.

Thoroughly assessing and managing risk is critical for keeping construction projects on time and within budget.

Risk management (RM) is a project planning and control function that includes proactive efforts to identify, mitigate, and control risk throughout the project delivery process.

MDOT has been successfully applying RM on innovative contracting methods and was looking to formalize and build upon its current guidance.

To make its entire RM process more streamlined and efficient, MDOT sought to evaluate the best practices nationwide and use the information to develop new tools, templates, training documents, and customized guidance.

The insight guided the department during the development of a new and improved set of customized tools, documents and guidance to ensure MDOT's construction projects are on track to save time and money.

BENEFITS

MDOT is better able to identify and manage project risks with a new RM toolbox, consisting of a variety of easy-to-use applications, templates and procedural guidance.

FIND OUT MORE . . .

Research Spotlight Brief:

<https://www.Michigan.gov/MDOT/-/Media/Project/Websites/MDOT/Programs/Research-Administration/Research-Spotlights/SPR-1711-Spotlight.pdf>

Final Report:

<https://www.Michigan.gov/MDOT/-/Media/Project/Websites/MDOT/Programs/Research-Administration/Final-Reports/SPR-1711-Report.pdf>

Risk Management Workbook:

https://www.Michigan.gov/mdot/-/media/Project/Websites/MDOT/Business/Contractors/Innovative-Contracting/Risk-Management-Template_MDOT-Risk-Management-Workbook_r1.xlsx

Michigan Department of Transportation

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Tools, Best practice, Risk Management

Buy America: Utilizing the NTPEP Compliance Certification Process



OVERVIEW OF INNOVATION

MoDOT has implemented a programmatic system where if a supplier is National Transportation Evaluation Program (NTPEP) compliant they no longer must submit material of origin forms with their steel or iron products. This process utilizes the existing AASHTO NTPEP Compliance program which already verifies Buy America Compliance for Steel and Iron items.

The current FHWA Buy America policy requires a material of origin form for every steel and iron component of a project. Additionally, it requires a material of origin form for each step in the process including smelting, shipping, coating and bending. The submittal process for the suppliers and contractors is very onerous. Also, each state has varying requirements and forms which makes compliance very challenging for suppliers. The DOT struggles to receive all the numerous required material of origin forms. The entire process is extremely time consuming and costly to administer.

If the steel and iron products for a project cannot be documented as domestic, the entire federal funding for a project is jeopardized. Most suppliers of steel and iron products such as rebar and traffic safety components (guard rail and end treatments) are NTPEP compliant. Verification of Buy America is part of the evaluation process to be a NTPEP compliant supplier.



Source: Missouri Department of Transportation

BENEFITS

If the supplier is NTPEP compliant, this process negates the need to submit and file, the thousands of materials of origin form we were previously processing. It saves hundreds of hours annually in processing documents. The process is much simpler to maintain which reduces errors. By simplifying the process, it greatly reduces the chance of missing documentation which can lead to all federal funding being lost on a project.

FIND OUT MORE . . .

Missouri Department of Transportation
Innovations Showcase

[Buy America NTPEP | Missouri Department of Transportation \(modot.org\)](#)

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Materials, Construction

Electronic Stormwater Inspection Process: Automated Reporting and Notification Process



OVERVIEW OF INNOVATION

In 2009, the Mississippi Department of Transportation (MDOT) Environmental Division was tasked with managing a new Stormwater Inspection Program which was developed to assist in compliance with the current Mississippi Department of Environmental Quality (MDEQ) Construction Permit. The vast amount hard-copy data that was compiled by weekly and monthly inspections was cumbersome and difficult to analyze and needed to be streamlined to maximize program management.

In response, the MDOT Information Systems Division developed two field inspection applications that could be accessed by smartphone, tablet or iPad.

The first application – the Erosion Control App – is used by contractors during permit-required weekly inspections to identify any observed deficiencies that may affect compliance with the construction permit and store this information in an electronically-accessed database.

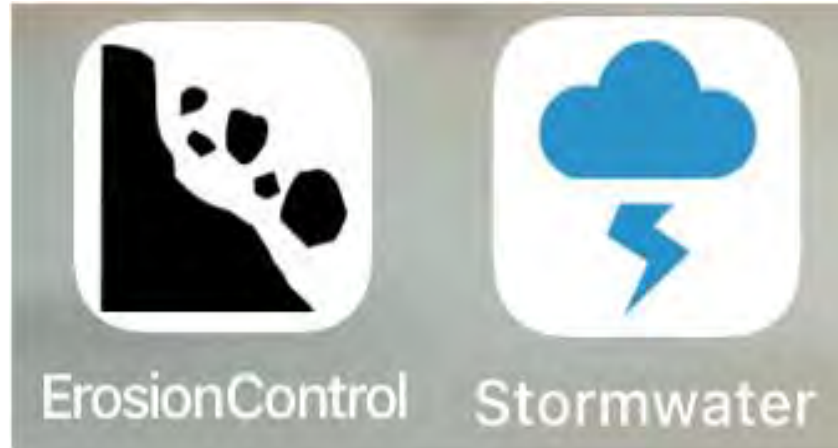
The Erosion Control App requires that all previously observed deficiencies stored in the database be addressed by the contractor before current inspection reports can be uploaded.

Once uploaded, two summary reports are then generated: 1) The MDEQ Site Inspection and Certification Form as required by the MDEQ permit and, 2) the MDOT Erosion and Sediment Control Field Inspection Report as required by MDOT contract.

The next application – the Stormwater App – is used by MDOT personnel and MDOT-contracted consultants during monthly quality assurance inspections to also identify observed deficiencies. This app then generates the MDOT Construction Stormwater Inspection Report which compiles five inspection “grades” into an overall Project Preparedness Rating.

Both apps consist of the following features:

- Data collection during site inspections (with or without cellular connection).
- GPS-integrated locations of field observations.
- Upload/storage of observation photos.
- Inspection data is stored in MDOT database.
- QA/QC review of inspection data prior to report generation (MDOT app)
- Reports are automatically generated, distributed and stored.



Source: MDOT

BENEFITS

Report generation and distribution time has been reduced from 7-10 days to 2-3 days.

Electronic storage and retrieval of reports.

Data collected used for analysis and dashboards

FIND OUT MORE . . .

MDOT homepage

<https://mdot.ms.gov/portal/stormwater>

MDEQ homepage

<https://www.mdeq.ms.gov/>

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Technology, Web App, Inspection, Electronic Reporting, Stormwater management

Electronic Stormwater Report access: On-site QR Codes



OVERVIEW OF INNOVATION

Mississippi Department of Environmental Quality (MDEQ) is required to go paperless by 2025.

Mississippi Department of Transportation (MDOT) provided a solution to MDEQ for the erosion control reporting process. The QR Code allows for simple, quick access to all documentation required to be onsite by MDEQ's permit.

With the implementation MDOT's erosion control and stormwater app, requiring electronic access to these reports on the job site was the next logical step.

The QR codes go out in the project documentation packet given to the contractors when they are awarded a project. These QR codes are printed on Weather and UV resistant Stickers. The Stickers are placed on the project site bulletin boards and mailboxes.

Stormwater Documents



Source: MDOT, <https://mdot.ms.gov/applications/qr/102046301000>

BENEFITS

- Quick access to electronic stormwater documentation required to be onsite
- Documentation previously easily damaged by weather or stolen from the job site, is now on a weather resistant sticker

FIND OUT MORE . . .

MDOT homepage

<https://mdot.ms.gov/portal/stormwater>

MDEQ homepage

<https://www.mdeq.ms.gov/>

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- QR code, Stormwater management, Erosion control, Technology

BridgeWatch: Public Safety Through Real-time Structure Monitoring



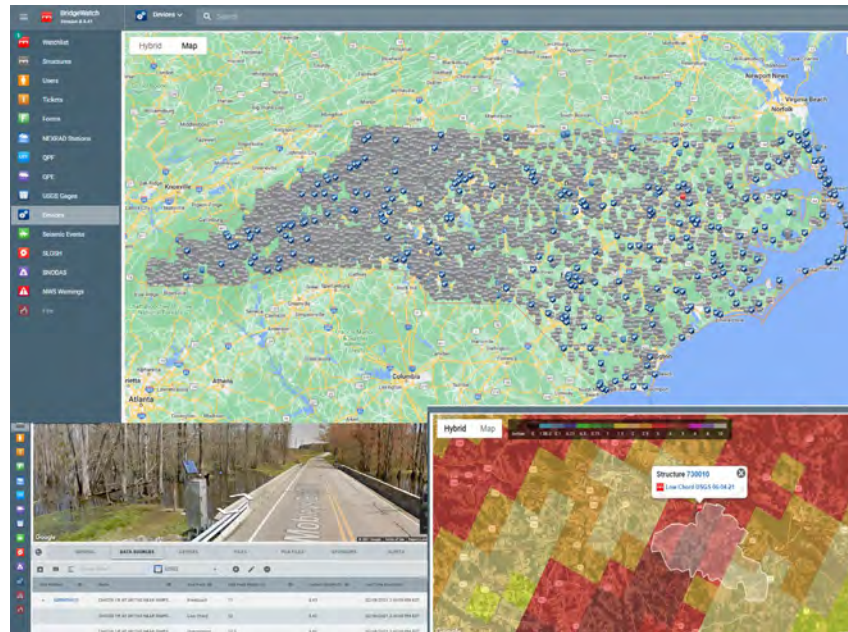
OVERVIEW OF INNOVATION

BridgeWatch empowers bridge management to predict, identify, prepare for, and record potentially destructive environmental events by proactively monitoring, in real-time, bridge infrastructure.

BridgeWatch collects and processes real-time data at regular intervals from meteorologic, hydrologic, and oceanographic sources, gauges, and other sensing devices. Data comparisons are then performed with internal NCDOT bridge parameters such as flood impact (floodwaters reaching structure levels) or roadway overtopping. NCDOT officials and Emergency managers can customize alerts, when appropriate, via any electronic medium (cell phones, email, application dashboard, etc.) when bridges are experiencing a dangerous or critical condition.

Officials are notified as sensors in the field detect water levels or high rainfall intensity levels that could indicate that the roadway is overtopped either at the bridge or bridge approaches based on elevation or design data. This valuable information can be used for road closure, emergency response, and post-event inspection prioritization.

In addition, BridgeWatch can also be utilized as a hands-on training and scenario tool for emergency evacuation or security drills with event simulation capabilities.



Source: BridgeWatch

BENEFITS

The benefits of using BridgeWatch include improved monitoring and awareness of structures impacted during major storm events.

In the past 3 years, the North Carolina DOT has piloted BridgeWatch and integrated it into its storm response. Structures management uses BridgeWatch alerted structures to aid in identification of critical structures to inspect post-storm.

FIND OUT MORE . . .

NCDOT BridgeWatch Website (Login Required) [BridgeWatch v8.4.41 from USEngineeringSolutions](#)

Hydraulics Storm Tools Website [NCDOT - Hydraulics & EM Flood Warning Tools - Home \(sharepoint.com\)](#)

US Engineering Solutions Website (BridgeWatch) <https://usengineeringsolutions.com/bridge-watch/>

NCDOT Hydraulics Unit

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Structure Management, Flood Warning, Emergency Response, Situational Awareness, Roadway Flooding, Hydraulics, Operations,

Right-Of-Way and Utility Dashboard

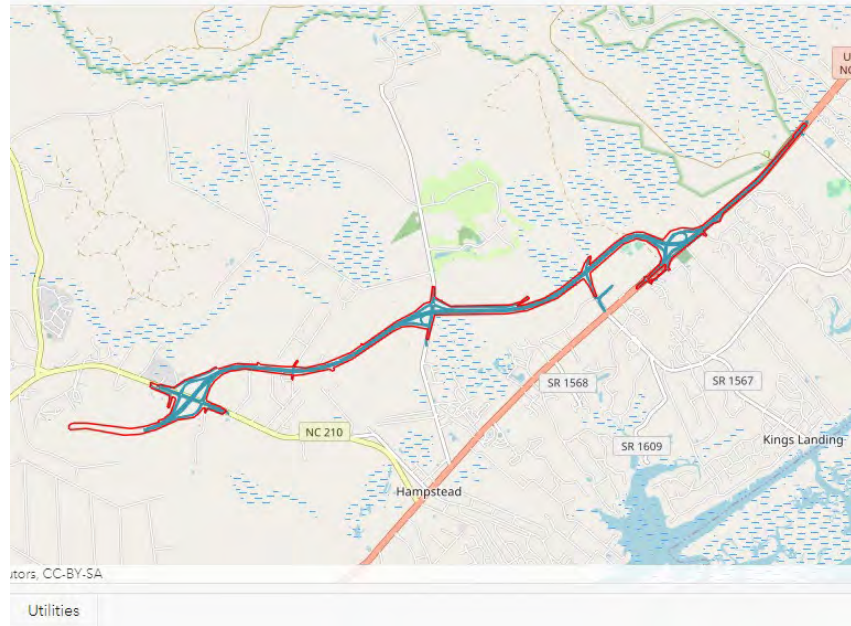


OVERVIEW OF INNOVATION

Priority parcels are determined based on construction phasing needs and are typically related to utility relocation durations. The tool combines the following into one GIS Map to prioritize parcels:

1. ROW Report B – submitted by ROW agents, tracks ROW acquisition progress and updates remaining ROW costs.
2. Utilities – added to the GIS map as a layer for easy cross reference.
3. Areas of Concern – Archeological sites, septic fields, wetlands, species habitat, etc. Each of these can be added as a layer.

To keep the tool up to date and accurate, a Microsoft Teams site was created. The shared excel file stay up to date and before each bi-weekly ROW meeting, the excel is converted to a CSV file and used to update the dataset of ArcGIS.



Website

BENEFITS

The purpose of the Dashboard is to quickly and clearly identify/track priority parcels and display the associated ROW costs.

FIND OUT MORE . . .

<https://ncdot.maps.arcgis.com/apps/dashboards/16a211fcc933453aa113ceb749086a4b>

Contact Info:
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Manager/Analyst

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Utility Dashboard, Priority Parcels, ROW

New Hampshire DOT incorporates a culvert diffuser in a pipe rehabilitation project in Exeter, New Hampshire.

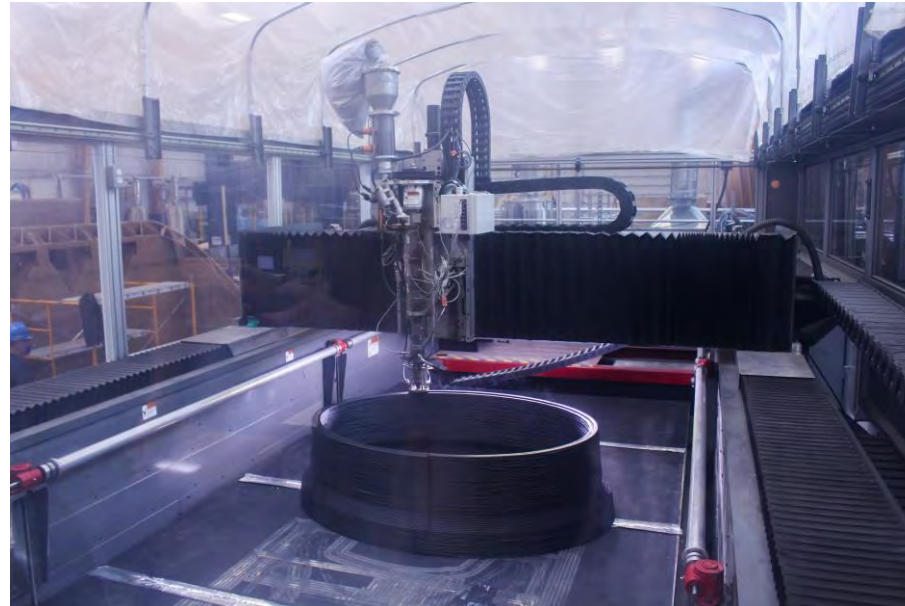


OVERVIEW OF INNOVATION

Building on a Maine DOT research project, State Transportation Innovation Council (STIC) funding provided for the inclusion of a culvert diffuser in a NHDOT project.

State DOTs have a need for increasing the capacity of existing culverts through deep embankments with high traffic and difficult access. Recent research by Maine DOT, has demonstrated the effectiveness of installing a culvert diffuser at the outlet, increasing the culvert capacity and lowering the outlet velocity.

A pipe rehabilitation at Rocky Hill Brook under NH 85 in Exeter, New Hampshire, was needed for NHDOT Project 43254. The NHDOT Highway Design Specialty Section developed an alternative solution for a 42-inch corrugated metal pipe (CMP) liner that incorporated a 15 foot long by 5.83 foot wide, 3D printed diffuser at the outlet.



3D printing of the culvert diffuser at the University of Maine in Orono, ME
Source: TIDC

BENEFITS

The installation of the diffuser at the outlet of the culvert provided an estimated 40 percent increase in outlet capacity. The innovative method of 3D printing was used in manufacturing the outlet diffuser at the Advanced Structures and Composites Center and Transportation Infrastructure Durability Center (TIDC) at the University of Maine, Orono, Maine.

FIND OUT MORE . . .

NHDOT Contact:

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Hydraulic Engineer
Bureau of Highway Design

Timothy.S.Mallette@dot.nh.gov

Project Partners:

Maine DOT
Alexander W. Mann

Outlet Diffusers to Increase Culvert Capacity (Technical Report 14-17)

<https://rosap.ntl.bts.gov/view/dot/31351>

Transportation Infrastructure Durability Center (TIDC), University of Maine

Dr. Roberto Lopez-Anido

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culvert diffuser, 3D printing

An engineered log jam provides erosion defense along the Magalloway River in Errol, New Hampshire.



OVERVIEW OF INNOVATION

A first for New Hampshire, the innovative engineered log jam solution was selected as the streambank stabilization method.

A section of NH 16 in Errol, NH, experienced extreme bank erosion that resulted in failure of the road structure. The installation of engineered log jams (ELJs) is a river restoration practice, implemented to modify flow structure and increase hydraulic complexity for the benefit of streambank protection and fish habitat (*L'Hommedieu, 2014*). Streambank protection options were evaluated and, because the roadway was realigned about 90 feet from the river, an ELJ could be considered and was ultimately selected. Construction was performed in winter 2020/2021 with topsoil and plantings completed in spring 2021.

The layered installation incorporated log members, with and without root balls, stone ballast, and a surface landscaping, restoring the streambank with natural materials. As part of the permitting process, NHDOT Research engaged the University of New Hampshire to perform the required pre- and post-construction monitoring and documentation.



Source: NHDOT



Source: SLR

BENEFITS

The ELJ provided the benefit of a natural instream structure and resulted in cost savings over a conventional bank stabilization system. Some trees harvested from the site during roadway realignment were incorporated into the ELJ. The results of the monitoring performed by UNH will document information on the hydrologic and environmental aspects of the ELJ.

FIND OUT MORE . . .

NHDOT Research Link:

<https://www.nh.gov/dot/org/projectdevelopment/materials/research/projects/26962w.htm>

Contract Administrator:

Dan Caouette, NHDOT

Daniel.N.Caouette@dot.nh.gov

Project Champion:

Tobey Reynolds, NHDOT

Principle Investigator:

Tom Ballestero, UNH

Designer:

SLR International Corp.

Contractor: *J.P. Sicard, Inc.*

engineered log jam,
streambank protection,
erosion, stormwater
management, environment,
construction, materials

Pipe Measuring Tool

OVERVIEW OF INNOVATION

Pipe measuring tool saves time when measuring pipe sizes for design builds or other applications and reduces the risks associated with entering confined spaces.

The Pipe Measuring Tool is constructed out of wood and can be inserted through a grate to measure pipe sizes, minimizing the risks involved with having someone physically enter a confined space. Using the measurement tool, the process of measuring pipe sizes for design builds or other applications is now a one-person task, and no longer requires entering the catch basin.

Craig Borgeson from the City of Laconia, NH DPW developed and constructed a simple tool out of wood that can be inserted through the grate to complete the measurement. It is constructed of one piece of wood strapping (1"x2") with a flat wedge attached at the end with hash marks showing predefined measurements (6", 8" 10" 12" and 15"). Limited time and resources were involved in constructing this tool as Craig used existing wood that he had on hand and limited labor time for the construction process.



Source: Craig Borgeson, City of Laconia, NH DPW

BENEFITS

The benefits of the pipe measuring tool include reducing the risks associated with entering confined spaces, reduced time spent on the roadway, less impact on roadway users, and reduced time spent by employees completing the task.

FIND OUT MORE . . .

Laconia DPW Website
<https://www.laconianh.gov/668/Public-Works>

UNH Technology Transfer Center
<https://t2.unh.edu/>

City of Laconia, NH DPW

Craig Borgeson
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Safety, Maintenance, Construction

Improving a road-stream crossing in northern New Hampshire benefits Eastern brook trout and mammals



OVERVIEW OF INNOVATION

New Hampshire DOT partners with The Nature Conservancy to improve wildlife connectivity across US 3 in Stratford, NH

Habitat fragmentation threatens the long-term sustainability of healthy wildlife populations. In 2009, New Hampshire Department of Transportation (NHDOT) and The Nature Conservancy (TNC) began addressing landscape connectivity across northern Vermont and New Hampshire. This project helped restore aquatic connectivity in the Connecticut River Valley by replacing a deteriorated culvert in a high priority site for Eastern brook trout and multiple mammal species that reside in the area.

The bottom of the culvert was specifically designed to provide for aquatic passage through a low flow channel and for mammal passage via a wildlife shelf. The project is part of the Staying Connected Initiative (SCI) that spans from the Tug Hill Plateau west of the Adirondacks, across Vermont, northern New Hampshire and Maine, and into the Canadian Maritimes.



Source: NHDOT



Source: NHDOT



Source: TNC



Source: TNC

BENEFITS

Six months of wildlife camera trap monitoring at the crossing indicated that the culvert is regularly used by small mammals to cross under US 3. It is anticipated that more wildlife will use the improved culvert rather than crossing at the roadway surface, enhancing safe passage for aquatic and terrestrial species and safety for drivers.

FIND OUT MORE . . .

NHDOT Contact:

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Project Partners:

- New Hampshire DOT
- The Nature Conservancy (TNC)
- New Hampshire Fish & Game
- National Fish & Wildlife Foundation

wildlife crossing, culverts, landscape, aquatic, terrestrial, connectivity, sustainability, environment, structures, stormwater management

Inlet Repair Trailer



OVERVIEW OF INNOVATION

The 2021 NJ Build A Better Mousetrap Award for a local public agency was given for an Inlet Repair Trailer. Montgomery Township's Public Works Department converted an older trailer into a basin repair trailer to eliminate the amount of equipment and time required to load and unload onto trucks.

The task of Inlet Repairs requires saws, various hand tools, concrete, block, bricks, wood for forms, water for concrete, concrete mixer, and a way to lift heavy grates. There can be significant labor time and safety considerations in loading and unloading trucks with needed equipment.

A generator, electric cement mixer, electric crane, electric water pump and water storage tanks, were mounted on the trailer. The trailer has plenty of room for pallets of concrete and basin block as well as lumber and all needed tools including electric outlets to operate saws. The labor to complete the project was around 100 hours and about \$3,500 was spent on equipment and materials for the trailer.



Source: New Jersey Department of Transportation

BENEFITS

By having all equipment and tools on one trailer, the Township reduced the number of vehicles needed from three trucks to one which offers equipment utilization efficiencies.

When mobilizing a crew for a project, all needed equipment can be found stored on the dedicated use trailer which can improve daily labor productivity

Working off a low deck trailer eliminated climbing into a truck bed, and the electric crane eliminated heavy lifting of the grates which improves worker safety.

FIND OUT MORE . . .

2021 BABM Award Winner Video:
<https://www.njdottechtransfer.net/share-your-ideas/build-better-mousetrap/>

2021 BABM Local Award Winner Video:
[2021 BABM Local Award Winner: Inlet Repair Trailer - YouTube](#)

Montgomery Township, New Jersey

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Maintenance, Stormwater Management

Ultra High Performance Concrete for Bridge Repair



OVERVIEW OF INNOVATION

An NJDOT pilot project demonstrated that UHPC overlay will provide durable bridge decks that will extend the service life of the structures. Additionally, the project showed that UHPC overlay construction methods can minimize traffic interruptions and shorten the total construction time.

NJDOT installed three UHPC bridge deck overlays as pilot projects. One of these projects, completed on a bridge spanning the Newark Turnpike, included both a UHPC bridge deck overlay and field-cast UHPC joint headers.

This curved 3-span bridge, originally built in 1979, feeds nearly 30,000 vehicles per day from the New Jersey Turnpike onto I-280. The heavy traffic and the impact of de-icing salts resulted in corrosion of the reinforcing steel in the existing bridge deck, as well as the deterioration of all abutment and pier expansion joints.

Prior to installation of the UHPC overlay and field cast UHPC headers, the existing asphalt overlay and deteriorated expansion joints were removed. A new UHPC header expansion joint solution was installed, and after installation the finished UHPC overlay was covered with asphalt.

The resulting 340-foot UHPC overlay is currently the longest continuous overlay installation in North America.



Source: New Jersey Department of Transportation

BENEFITS

UHPC bridge overlays offer superior bond strength, compressive strength, lower permeability, more resistance to freeze thaw-damage, good abrasion resistance, and rapid cure times, among other benefits.

Increases safety and efficiency due to fewer days required for construction, and less impact on the traveling public due to traffic interruptions.

FIND OUT MORE . . .

NJ STIC, UHPC for Bridge Preservation and Repair in NJ

<https://www.njdottechtransfer.net/UHPC-bridge>

Design, Construction, and Evaluation of UHPC Bridge Deck Overlays for NJDOT - Presentation

<https://www.njdottechtransfer.net/UHPC-presentation>

New Jersey Department of Transportation

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Structures, Construction, Pavement, Materials

Bridge Upcycling



OVERVIEW OF INNOVATION

“Upcycling is the act of taking something no longer in use and giving it a second life and new function.” - Habitat for Humanity.

The innovative Ohio County Engineer’s Bridge Upcycling program is the state LTAP Center’s top Local Public Agency success story.

The Ohio Department of Transportation partnered with the County Engineers Association of Ohio to upcycle steel beams leftover from bridge projects that were demolished or rehabilitated.

Reusing this existing product helps stretch financial resources and reduces potentially unsafe bridge rating conditions.

Two Ohio counties, Defiance and Muskingum, have successfully used upcycled steel beams on several projects.

"It's a benefit to our county, a benefit to our community, and we're not scrapping valuable products," said Muskingum County Engineer Mark Eicher.

Defiance County Engineer Warren Schlatter praised the program's cost savings benefits and is confident that the bridge is just as safe and just as strong as if they had used new steel.

"So, in the end the capacity of the bridge is not of concern. These are rock solid bridges," he said.



Upcycled bridge beams ready for a local construction project. - The Toledo Blade newspaper

BENEFITS

Upcycling reuses steel bridge beams that previously had been discarded.

Saves costs by reducing the need to fabricate new material.

Enables additional bridge reconstruction and enhances motorist safety.

FIND OUT MORE . . .

<https://youtu.be/r5AyX5uDH8U>

Muskingum County Engineer

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Sustainability, Planning, Structures,
Construction, Materials, Asset
Management

Backhoe Folding Forks

OVERVIEW OF INNOVATION

Backhoe folding forks help crews be more efficient while reducing the risk of injuries.

Clearfield County in PennDOT’s Engineering District 2 has installed foldable forks on backhoes – something routinely done in private industry. The forks can be installed to move items such as pallets or large sections of pipe and can be folded out of the way – depending on what the work needs are for a particular assignment. This helps crews be more efficient and it also reduces the risk of injury from lifting and moving heavy objects.

The forks are attached to the digging bucket. While in use, the forks are flipped down and rest against the cutting edge of the bucket. When not in use for loading/unloading, they fold back over the top of the bucket and are out of the way while performing digging operations. This simplifies use of the backhoe in the field on a routine basis without installing or removing attachments.

By using the foldable forks, a second piece of equipment, such as a forklift or track hoe, is not needed. More importantly, the foldable forks provide a more stable platform and fewer moving parts than using chains connected to the track hoe bucket. This provides the operator better control of the load during lifting operations. By using this method, the safety factor is higher, and the potential for injury is lower. Productivity is also increased because it takes less time to complete load and unload activities.



*Forks folded over attached to digging bucket of backhoe.
Source: PennDOT*

BENEFITS

The benefits of using backhoe folding forks include increased efficiency and reduced injury risks. This innovation also allows for the capability of performing two different operations using one piece of equipment. Additionally, forks fitted with hydraulics allow operators to deploy the forks and adjust widths automatically.

FIND OUT MORE . . .

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Construction, Maintenance

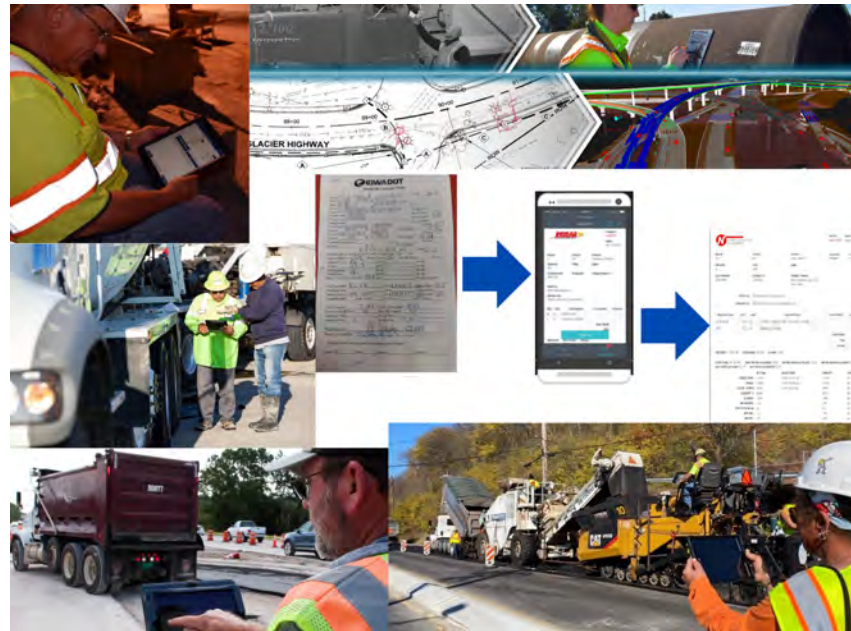
Hybrid EDC Training: Success Stories of e-Ticketing in Puerto Rico



OVERVIEW OF INNOVATION

The Puerto Rico LTAP has adapted its training program to address a combination of strategic virtual webinars and in-person seminars to be able to open the educational spread.

- Peer exchange with representatives from the public & private sector, Associated General Contractors (AGC), federal government, resource center & DOT representatives from Delaware & Pennsylvania.
- DOT Construction & Material Office staff exchange ideas with the Aggregates, Asphalt, and Concrete representatives to go paperless promoting e-ticketing for the processes using iPads, mobile phones, etc.
- In-person activity at the College of Engineers and Surveyors of Puerto Rico with the support of the transportation community.
- At the same time, remote participation from Municipalities and other interested professionals.
- e-Ticketing Demonstration from Vendors (Headlight, Fleetwatcher, HaulHub and Equipment Watch).



Source: PRHTA, FHWA, PennDOT & PRLTAP

BENEFITS

Participation from other locations of the Island. Increase of over 50% in participation.

Also allowed other key speakers in US to present virtually.

Significant travel time savings to local transportation officials that are located far from the College of Engineers and Surveyors of Puerto Rico.

Provide opportunity to the future workforce to be up-to-date on new initiatives and innovations in the field.

FIND OUT MORE . . .

PRLTAP Website

<https://www.prltap.org>

PRLTAP Webinars Recordings

<https://www.gotostage.com/channel/prltap>

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Technology Transfer, Continuing Education, e-Ticketing, EDC

PMIS and its benefits for e-construction



OVERVIEW OF INNOVATION

The Project Management Information System (PMIS) is a comprehensive solution to streamline the full project life cycle management including Planning, Design, Environmental, Land Acquisition, Bids, Construction and Closing with the objective to expedite the project delivery, improve accountability, security and audit capability and being the single source of truth for all projects.

PMIS is a cloud web-based solution and includes a mobile app for allowing the access to the system from anywhere including field activities. This PMIS has been designed with more than 100 business processes that allow compliance with the procedures and requirements of Puerto Rico Highways and Transportation Authority (PRHTA) and FHWA for the management of construction projects and professional services associated with the different phases of the project.

All business processes defined in PMIS are supported by the centralized document repository that facilitates agency-level collaboration, thus keeping all project information in one place. PMIS workflows allows the user to approve and electronically sign off.

PMIS is integrated with the PRHTA's financial systems (Oracle EBS) to streamline the finance process. PMIS will carry out the allocation of funds and budget for a project, and the creation and approval of contracts, change orders and payment certifications for each project. PMIS is a Web Based solution and includes a mobile app for allowing the access to the system from anywhere including field activities.

PMIS has an electronic bidding module that includes a Web Portal for bids activities, from publication to award, which is supported by business processes designed for the creation of estimates and specifications packages, approvals, questions and answers and for the automatic generation of the resulting contracts.

PMIS is a solution built on the Oracle Primavera Unifier solution, which has extensive integration capabilities with other systems like Laboratory Material Testing System, FMIS, e-ticketing, among others. In addition, it has the ability to generate reports, supported by Oracle BI Publisher.

BENEFITS

- Standardize processes through all organization and eliminate silos
- Streamline the project delivery processes by electronics signoff and approvals; and provides the contract documents in a paperless environment.
- Single source of truth for all projects
- Better projects funds visibility and tracking
- Integration between accounting, project controls and more
- Better security, audit, and backup

FIND OUT MORE . . .

End-user e-Learning site:

<https://pmis-elearning.info/>

Oracle Unifier, PMIS platform:

<https://www.oracle.com/industries/construction-engineering/primavera-unifier-project-controls-facilities-asset-management/project-controls-datasheet/>

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PMIS, Single Source, Project Development, Business Processes, Technology

Develop a DOT Specific UAS Simulator and Flight Proficiency Exam



OVERVIEW OF INNOVATION

Most state DOT Unmanned Aircraft Systems (UAS) commercial operations are governed by CFR 14 Part 107. This regulation requires pilots pass a knowledge test but does not require a demonstration of minimum flight proficiency to operate in the national airspace. This project addresses this limitation by developing a computer-based flight proficiency simulator based on the National Institute of Standards and Technology (NIST) Basic Maneuvering Test (BMT). The simulator realistically recreates environmental conditions, UAS physics, stick control and field conditions of the BMT. A “drone rodeo” was hosted to evaluate if the simulator BMT performance data is simulator to traditional in-person methods. Twenty-four Part 107 pilots completed the BMT in-person and with the simulator. At 95% confidences, the pilots scores at times were statistically the same. The significant percentage of the SCDOT pilots completed the BMT under proctored conditions. Based on their performance and similar nationally recognized organization’s certifications, the research team recommends that the SCDOT require a minimum score of 80% on the BMT with a maximum duration of 5 minutes per maneuver before flight privileges are granted. In addition to the NIST scenarios develop, a bridge inspection scenario was developed to support this common use for UAS.



Source: Clemson University

BENEFITS

Drone flight proficiency is a skill that requires continual practice. The simulator developed in this project provides a convenient way to practice, teach and assess UAS flight skills. This software is available at no cost to all state DOTs.

To date, 24 state DOTs have requested licenses and made this simulator an important part of their drone program.

FIND OUT MORE . . .

Little Arm Studio:

<https://www.zephyr-sim.com/>

Clemson University – Department of Construction, Development, and Planning:

<http://www.clemson.edu/degrees/construction-science-and-management>

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UAS, UAV, Drone, Simulator

Strategic Deployment of Drone Technology and Software to Support SCDOT Operations



OVERVIEW OF INNOVATION

A recent FHWA publication found that all 50 state DOT's are using Unmanned Aircraft Systems (UAS), commonly referred to as "drones," in some capacity. As the cost of UAS equipment can be relatively low, the greatest challenge limiting the benefit that this technology can provide is the lack of education and training. By partnering with Clemson University, this project aggressively addressed this challenge and made meaningful drone deployment a viable option for employees across the SCDOT. The project leveraged Clemson University's nationally recognized School of Construction Management to develop a drone training program tailored to the SCDOT's needs. The course was structured so Clemson students and SCDOT employees could work shoulder-to-shoulder as they learned leading edge drone workflows. The program participants came from a wide range of SCDOT offices including (among others) Construction, Communications, IT Services, Preconstruction Engineering, Planning, Traffic Engineering, Survey and Maintenance. Through its professional studies program, Clemson University has made this course available fully online to any state DOT.



Source: Clemson University

BENEFITS

This project created an in-person and online drone course for SCDOT employees. During the class, students earn their FAA Part 107 drone license, flight skills (in-person and with a simulator), and how to create 3D maps/models with drone data. It is an excellent way for employees to gain the skills and knowledge to operate a UAS to benefit their department.

The course is available online for all state DOT employees.

FIND OUT MORE . . .

Overview video of the course:
<https://www.youtube.com/watch?v=YlkoQl64D3w>

Clemson University – Department of Construction, Development, and Planning:
<http://www.clemson.edu/degrees/construction-science-and-management>

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UAS, UAV, Drone, Class, Course, Professional Development

Assessing Efficacy of Amphibian and Reptile Exclusion Fence (AREF) to Prevent Herpetofauna, with Emphasis on Houston Toad, from Entering Construction Zones



OVERVIEW OF INNOVATION

The federally endangered Houston toad (*Anaxyrus houstonensis*) requires effective measures against incidental take within its limited habitat range. This project addresses the need for evaluation of Texas Department of Transportation (TxDOT) amphibian and reptile exclusion fencing (AREF) for its efficacy in preventing federally endangered Houston toad entry to construction zones and roadways within its designated critical habitat.

Three amphibian and reptile exclusion fences were tested for wildlife exclusion efficacy between 2020 and 2022

After rigorous trials and assessment, the TxDOT designed AREF proved effective and acceptable as an exclusion fence for adult and juvenile toads. The TxDOT AREF is recommended as it is as effective or more effective than other commonly used fencing in excluding toads and in facilitating escape in jump-out configurations and is as durable as the commercially available fencing.



Source: TxDOT Project 0-7078

BENEFITS

TxDOT AREF is the most cost effective and easy to install.

Due to factors of high toad exclusion efficacy, low cost, and high durability, TxDOT Geotextile fencing is suggested for installation with jump-outs for prevention of Houston toad mortality in construction areas.

FIND OUT MORE . . .

Project Web Link: [TxDOT Research Library: Project No. 0-7078 – Amphibian and Reptile Exclusion Fence \(AREF\)](#)

Video: <https://youtu.be/Ug3nzomelBA>

Texas STIC Website: <http://txstic.org/>

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Mark Fisher, Project Lead, TxDOT

Robert Coulson, Principal Investigator, Texas A&M University

Keywords: Environment, Stormwater Management, Construction

Perform Feasibility Study on Use of Innovative Tools and Techniques to Accelerate Pavement Construction



OVERVIEW OF INNOVATION

2022 Sweet Sixteen Winner

The goal of accelerated construction is to minimize construction zone impacts to the driving public. This research project investigated techniques to evaluate the pavement condition, rehabilitation options and estimate pavement construction traffic impacts before letting.

There is potential for significant time and money savings when the existing pavement, proposed pavement design, and traffic control scenarios are evaluated and optimized.

A novel construction schedule/cost/traffic integration approach was implemented to help TxDOT make the most informed decisions regarding balanced trade-offs to lessen traffic disruption to the traveling public while minimizing construction time and road user cost.

The researchers prepared and presented training materials and guidance to include methodology, testing procedures, and other tools used in the selection and design of pavement for candidate projects.



Source: TxDOT Project 0-6985

BENEFITS

Value to TxDOT: Leads to routinely selecting pavement design strategies that are fast to construct to achieve statewide goals.

Savings for TxDOT: The ROI to TxDOT is expected to be \$150.13 for every dollar spent on this research project.

FIND OUT MORE . . .

Project Web Link: [TxDOT Research Library: Project No. 0-6985](#) – Use of Innovative Tools & Techniques to Accelerate Pavement Construction

Video: <https://youtu.be/ENl4t82yf1w>

Texas STIC Website: <http://txstic.org/>

Contact Info:

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Darlene Goehl, Principal Investigator, Texas Transportation Institute

Keywords: Pavement, Design, Construction

Design Technology for Ultra High Performance Concrete (UHPC) Precast, Prestressed Bridge Girders



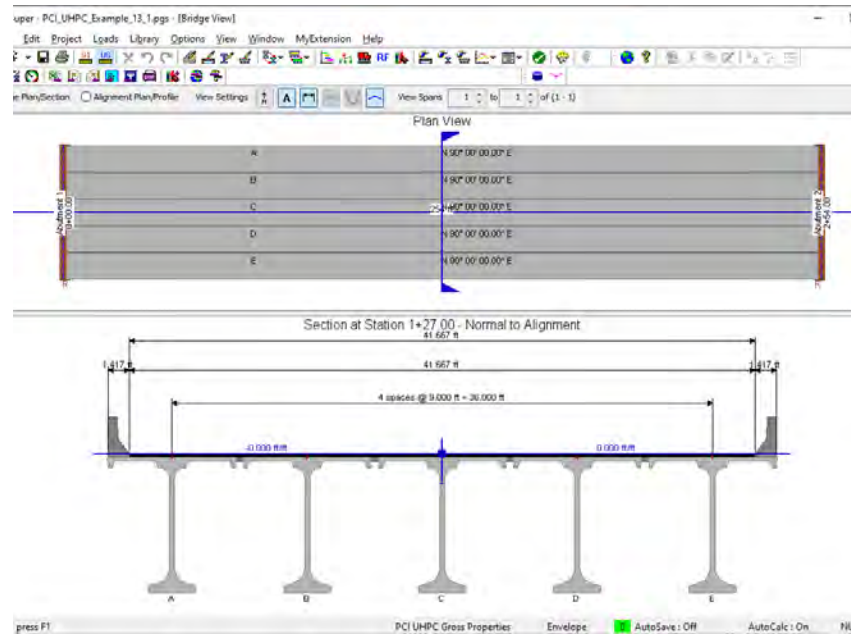
OVERVIEW OF INNOVATION

UHPC is an innovative concrete material gaining traction in the US infrastructure sector. The BridgeLink:PGSuper bridge design software has been updated to support design for precast, prestressed UHPC bridge girders.

UHPC is a fiber-reinforced composite cementitious material with unique properties that differ greatly from conventional concrete. UHPC provides superior durability and high tensile and compressive strengths compared to other classes of concrete. The Precast/Prestressed Concrete Institute (PCI) and the Federal Highway Administration (FHWA) have developed structural design guidance for precast, prestressed concrete bridge girders manufactured with UHPC. This guidance is being coalesced into AASHTO guide specifications.

Washington State and Texas Departments of Transportation collaboratively developed open-source bridge design software named BridgeLink:PGSuper. This software is used by DOT, local agency, and consulting engineers around the country and by international engineering organizations. The software has been recently updated to support design of precast, prestressed UHPC girders with both the PCI and FHWA structural design guidance.

Many US bridge engineers are unfamiliar with the use of UHPC in precast structural elements. The BridgeLink:PGSuper design technology reduces barriers for adopting UHPC solutions and provides engineers with an important tool that supports the implementation of UHPC in US infrastructure projects.



Source: WSDOT

BENEFITS

The benefits of the BridgeLink:PGSuper software and its UHPC design capabilities includes:

- supporting national implementation of UHPC bridge girders
- open-source software available to everyone for production design and research implementations
- educating design engineers on UHPC design requirements

FIND OUT MORE . . .

WSDOT Bridge Software Tools
<https://wsdot.wa.gov/engineering-standards/design-topics/bridge-software-tools-downloads>

Tadros, M., *Implementation of Ultra-High Performance Concrete in Long-Span Precast Pretensioned Elements for Concrete Buildings and Bridges, Phase II Report*, Sept. 15, 2021, Precast/Prestressed Concrete Institute

WSDOT Bridge and Structures Office

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Precast, Prestressed, Concrete, Girders, UHPC, Software, Structures, Design, Technology, Pavement

Innovative Design Technology for Ultra Long Span Precast, Prestressed Concrete Bridge Girders



OVERVIEW OF INNOVATION

Advanced design methodology coupled with state-of-the-art software enable design of ultra long and efficient concrete bridge girders, reducing project cost and improving on-site safety.

Extending the span length of precast concrete bridge girders beyond 200 feet in length presents unique challenges for design, fabrication, handling, and erection. An advanced design methodology cooperatively developed by the Washington State DOT and local precast concrete producers results in designs that support optimized fabrication and safe handling of precast concrete girders at the manufacturing facility, during transportation, and on-site.

State-of-the-art open-source software, named BridgeLink:PGSuper, has been collaboratively developed by the Washington State and Texas Departments of Transportation implementing this design technology. This software is used by DOT, local agency, and consulting engineers around the country and by international engineering organizations.

The technology for designing ultra long span girders has been successfully deployed in Washington State. The recently completed Wapato Way bridge over Interstate 5 in Fife, WA features 220 ft long girders weighing in excess of 220,000 lbs. each, spanning 10 traffic lanes, 4 shoulders, and the median in a single span. The median pier was eliminated reducing project cost and improving on-site safety by eliminating the dangerous work area between north and southbound highspeed traffic. The recently completed Interstate 5 bridge over the Puyallup River features a span of record setting 223 ft long girders.



Source: WSDOT

BENEFITS

The benefits of the BridgeLink:PGSuper software and its advanced design technology include:

- reduced design time
- technical solution for designing ultra long span precast, prestressed girder
- designs that support optimization of fabrication processes
- improved safety during manufacturing, transportation, and on-site construction activities

FIND OUT MORE . . .

WSDOT Bridge Software Tools
<https://wsdot.wa.gov/engineering-standards/design-topics/bridge-software-tools-downloads>

WSDOT Bridge Design Manual
<https://www.wsdot.wa.gov/publications/manuals/fulltext/M23-50/BDM.pdf>

Brice, R. 2009, *Design optimization for fabrication of pretensioned concrete bridge girders: An example problem*. PCI Journal, Fall 2009, V. 54, No. 4. pp 73-111

WSDOT Bridge and Structures Office

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Precast, Prestressed, Concrete, Girders, Bridges, Fabrication, Optimization, Safety, Design, Construction, Technology

Movable Sign Fabrication Table

Innovative Design for Easy Adjustment and Efficiency in Building Signs



OVERVIEW OF INNOVATION

The two-person Sign Installation Team at the Washington State Department of Transportation in South Central Region is responsible for building and installing signs along highways in the region. Each sign is delivered in panels to be built before installation. Due to the large size of the signs, the team noticed the stationary table they were using was starting to affect them physically. They needed a table that could adjust to the height of the sign during fabrication. After researching a variety of designs and models, the team designed a hybrid model to fit their needs – a table with easy adjustment to efficiently build signs with less physical demand.



Source: WSDOT



Source: WSDOT

BENEFITS

Benefits of using the movable sign fabrication table are:

- **less physical strain on workers**
- **improved sign fabrication efficiency.**

Using the movable sign fabrication table decreases the likelihood of injury and burn out of the team.

FIND OUT MORE

Sign Shop Website:

<https://wsdot.wa.gov/business-wsdot/highway-signs/sign-shop>

Sign Installation Team:

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Sign fabrication table, easy adjustment, efficiency to building signs, design lessens physical demand, operations, safety, design, ergonomic

Spokane County Design and Fabrication of Grader Boots (Snow and Gravel)



OVERVIEW OF INNOVATION

Spokane County ER&R Crew designed and fabricated new boots for County graders to optimize multiple pieces of equipment, while saving overall costs.

Spokane County welders designed a boot that would require no modification to fit on motor graders from different manufacturers (e.g., Caterpillar and John Deere). The mounting plate on the moldboard is the only thing that is different.

The citizens of Spokane County have been requesting that the snow berms in their driveways be manageable to remove. The County's motor graders are used in both rural and urban operations. In the rural area, snow wings are required. In the urban area snow boots are required. The welders designed and fabricated a boot that was the right size and could be quickly fitted to all motor graders, no matter the manufacturer. The quick release attachment means our staff can quickly and easily change out the product on multiple pieces of equipment while not having to remove the existing wing.

In addition to optimizing operational time and getting a great product, approximately \$243,000 in costs were saved in the production of 26 boots versus purchasing a product that would have to be modified to meet all the County's needs.



Source: Spokane County

BENEFITS

By designing and manufacturing snow boots in house, Spokane County can:

- **optimize time,**
- **save on costs, and**
- **get the exact product needed in the field.**

FIND OUT MORE . . .

Spokane County

[Spokane County, WA | Official Website](https://www.spokanecounty.org/)

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Snow Boot, Grader, Fabrication, Design, Operations, Maintenance