



A Transformational Tool: Michigan's Epoxy Injection Rig

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Michigan's epoxy injection rig—an invention of Aaron Porter and Cliff Graves—travels the state to help Michigan agencies maintain their concrete structures. Photo: A void formed by delamination.

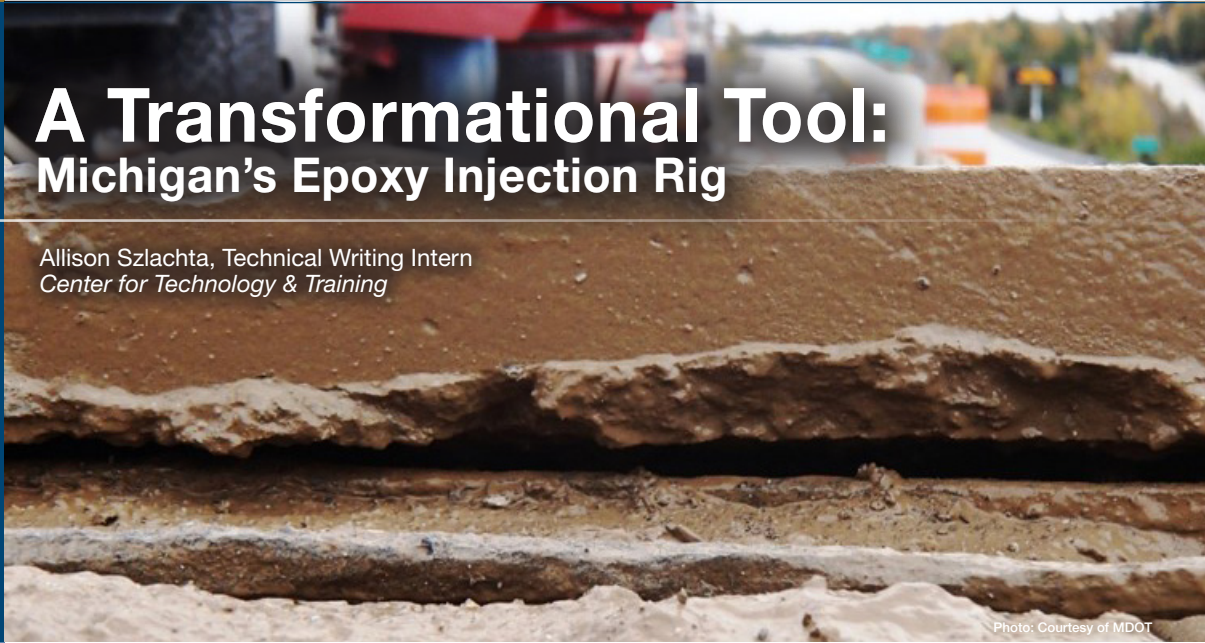


Photo: Courtesy of MDOT

The calculus of innovation is really quite simple: Knowledge drives innovation, innovation drives productivity, productivity drives economic growth,” said American radiologist William Brody.

Bringing those words to life, Aaron Porter and Cliff Graves have been using their knowledge to drive the transformation of their everyday technologies into a tool for managing tools, increasing their productivity and ensuring a safe, effective transportation network for Michigan road users. The two work at the Michigan Department of Transportation (MDOT). “We do statewide bridge preservation and assist all MDOT Region bridge maintenance crews,” explained Porter, adding he and Graves are available to help local agencies as well. Porter is the statewide transportation maintenance coordinator while Graves is an epoxy specialist for bridge repair who has been doing epoxy injections and polyurethane treatments for over 30 years.

Bridge decks are susceptible to mechanical wear in addition to the weather conditions that affect the entire structure. As such, bridge decks often require more repair than other structural components.¹ Overlays, for example, can become delaminated over time due to weak bonding between concrete overlay and deck concrete, vibrations, or poor construction.¹ The delaminations that form cause cracking that allows for the intrusion of unwanted substances, most commonly water, into the deck structure.² Epoxy, a waterproof sealant with a very high bond strength, is a common treatment for stress

cracks in concrete. It can also be injected into delaminated areas of bridge decks, and culverts. As an injection for delaminations, this technique is a minimally-invasive, efficient, and cost effective way of restoring a structure's integrity. The technique involves injecting epoxy through ports into the delaminated areas. “Epoxy injection can extend the life of a bridge deck without having to do jack hammering and conventional deck patching,” explained Porter. “With this process, we can do in a couple of days what might take a couple of weeks with other repair techniques.”

Epoxy can also be used to fill cracks in concrete structures. This technique works best with hairline cracks (wider than 0.1 millimeters).³ For filling cracks, injection ports are installed into holes drilled into the cracks, and then cracks are vacuumed to remove debris, sealed, and filled with epoxy. The fast curing time for the epoxy means that bridges can be re-opened to traffic approximately one hour after the injection process is completed.² Epoxy crack injection can “restore the structural integrity of damaged members”.³ It also prevents water and chloride intrusion, thus reducing freeze-thaw-related damage.³ Furthermore, epoxy injection can extend the structure's life by approximately 5 to 10 years.¹

Before Porter and Graves brought this innovative technique to Michigan, they visited Iowa to learn their processes for using epoxy to restore structural integrity of bridges. Porter and Graves then developed their “own system” for epoxy injection that starts with MDOT's Bridge Unit identifying bridges that are “delaminated but don't have

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Letter from the Editor

There's one thing I'm certain we can all agree upon: time flies! Today, it's the end of May and, before you know it, it'll be the end of December. Somewhere in the seemingly ever-quickening pace of time, we present four issues of *The Bridge* to you each year.

If you've participated in an article before, you might have an inkling about what is involved in the development an article for the newsletter. What goes on behind the scenes of each issue?

At least three months before an issue is due for publication, the Michigan Local Technical Assistance Program (LTAP) engineering and technical writing teams meet and select story ideas for the issue. Most often, we get our inspiration from conversations we have with you over the phone or at one of our training events.

After we have selected a few inspiring stories, our technical writing team develops a pitch (like a mini proposal) for each article, conducts research and interviews with sources, and writes a draft that's carefully edited to match the newsletter's style. Then, the writers work closely with subject matter experts (SMEs)—Michigan LTAP engineers assigned to particular articles based on their areas of expertise—who review the draft's technical details and applicability to Michigan's local road- and bridge-owning agencies. From there, we develop a galley proof—the article as laid out for publication—that is sent to each source to review and approve. This fine-tuning takes time as the technical writers, SMEs, and sources work to ensure accuracy and relevancy of every article in *The Bridge* newsletter.

Through this development process, we hope to provide you with articles, like the three in this issue, that are engaging and useful. Our first article in this issue is the story of Michigan's epoxy injection rig and how Aaron Porter and Cliff Graves are making epoxy injection and polyurethane grouting treatments easily available to agencies across the state of Michigan at low costs.

Then, we present the story of an innovative collaboration between Washtenaw County Road Commission and the county's technical rescue team. This partnership is making trench work safer for the road commission and providing the tech rescue team with valuable experience.

And, in these pages, we introduce you to Darrell Cass, Menominee County Road Commission's (CRC) new engineer-manager. He shares his insights on how his extensive experience in various department of transportation (DOT) positions has prepared him for CRC work.

Finally, we've included a few pieces from other states' LTAP publications that have valuable information applicable to Michigan's local agencies.

But, the success of every article depends on your stories and your innovations. If you've never participated in an article for *The Bridge* but have a story about an innovation at your agency, we invite you to reach out to us with your suggestion by emailing us at ctt@mtu.edu. We want to hear about your innovative engineering projects, operations and management strategies, shop products and practices, and safety resources.

In that blip of time between the release of this issue and the next, know that we are listening to you and working on articles that we hope are engaging and useful, and we are looking forward to receiving article suggestions from you.

Victoria



PHOTO CONTEST!

CATEGORIES

- Summer road maintenance**
(pavement repairs, mowing, grading, dust control, tree cutting, safety)
- Winter road maintenance**
(plowing, deicing, anti-icing, cutting banks, removing snow)
- Bridges & culverts**
(inspection, repairs, maintenance)
- People**
(work crews, community outreach, public events, school events, training)
- Equipment**
(new or historic equipment, innovations, equipment for a cause)

DEADLINE: December 31st

Photos judged on:
- fit for the category
- general composition
- aesthetic appeal (e.g., perspective, lighting)

Submitted photos should follow safety requirements for the depiction and should be clear and high resolution

PRIZES

Per Category: Free CTT webinar of your choice

Grand Prize: Free one-day conference registration of your choice

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Photo: Courtesy of Washtenaw CRC

An Innovative Partnership to Make Trench Work Safer

Victoria Kaplewski, *Technical Writer*
Center for Technology & Training

In 1735, Benjamin Franklin anonymously wrote a letter to the *Pennsylvania Gazette* on fire prevention methods in Philadelphia. Therein, he asserted, “An ounce of prevention is worth a pound of cure.” Franklin’s words are just as relevant 288 years later and to technical rescue teams—a specialized type of first responders.

“Technical rescue teams are designed for the out-of-the-ordinary incidents above and beyond car crashes and the like,” explained Dan Olson, who is a lieutenant for Pittsfield Township Fire Department and serves on Washtenaw County’s “tech” rescue team’s command staff as the rescue group manager. “Our tech rescue team does special trainings on building collapses, rope rescues, confined space incidents, trench rescue, and some very-complex large truck extractions.” Consequently, in comparison to average fire departments, tech rescue teams employ more and different equipment for tackling complex incidents.

Trouble in Trenches

Ken Harris, superintendent of maintenance at Washtenaw County Road Commission (CRC), points out that tech rescue teams are not used to the type of conditions common in trench work. Trenching is a common task for road-owning agencies for placing culverts or

accessing utilities or other roadway elements and involves “narrow excavation[s]”, usually 15 feet wide or less, “below the surface of the ground” to a depth that’s usually greater than the width [OSHA]. Oftentimes, trenches only have easy access points at each end.

“Conditions of a trench can change by the minute,” explained Harris. He points out that safe trenching requires proper identification of soil types, the angle of repose of the excavation, overhead hazards, and water-related hazards. Trench conditions have to be re-evaluated when a culvert is placed within it, says Harris, because having “an open trench with a culvert within it changes the dynamics of the whole process”.

“A trench collapse is our biggest concern,” said Harris.

He continued, “We have these tight-knit groups at work that’ll do anything for each other, and we don’t want a trench collapse scenario where one worker jumps back in that hole try to rescue another worker and a secondary collapse happens and both are buried.”

His concerns are not unfounded. In fact, the US Department of Labor Occupational Safety and Health Administration (OSHA) issued a national news release in July 2022 pointing to an “alarming rise in trench related fatalities”.¹ According to the release,

22 workers had lost their lives in trenching and excavation work in the first half of 2022 compared to 15 workers in all of 2021.¹

Ounce in Prevention: A Training Partnership

Harris has been investing an ounce in prevention: he’s tackling the dangers of trenching by forging an innovative relationship with the tech rescue team in his area. He related, “Several years back, we did a trench awareness training with Lenawee County Road Com-

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Did You Know?

Before workers enter a trench, OSHA requires competent persons—those who can identify existing or potential hazards or dangerous working conditions, determine the necessary protective systems, and implement prompt corrective measures—to inspect trenches daily and as conditions change. OSHA also specifies that means of egress must be within 25 feet laterally of workers in trenches deeper than 4 feet. Learn more:

- OSHA Fact Sheet: *Trenching and Excavation Safety*, https://www.osha.gov/sites/default/files/publications/trench_excavation_fs.pdf
- OSHA. *Trenching and Excavation Safety* (booklet), <https://www.osha.gov/sites/default/files/publications/osha2226.pdf>

Trench Work (continued from page 3)

mission.” The instructor Dustin Brighton, who conducts a number of safety trainings (including chainsaw safety training) for local road-owning agencies, commented on how fortunate Washtenaw County’s was to have a good technical rescue team in its locale.

That comment prompted Harris to reach out to Olson, and the two discovered a way to collaborate in trench safety efforts. “We were able to open up our main yard to the tech rescue team so they could perform their annual trench rescue training,” said Harris. Washtenaw CRC dug an 8-foot by 8-foot by 8-foot trench in its yard for Olson and the tech rescue team to practice trench rescues.

For Olson, the collaboration between the two agencies has allowed his tech rescue team to explain safety considerations and trench rescue processes to the road commission. “The road commission brings out its new employees to see what a trench is like, what can happen, what they can do to mitigate an emergency, and how they can help us during an incident,” he shared.

The following year saw continued investment in prevention by both Washtenaw CRC and the tech rescue team. Washtenaw CRC not only dug another trench for the tech rescue team’s annual training but also tested response times and tools available on site.

Washtenaw CRC placed a dummy in the trench before calling in a trench collapse on its emergency radio system. “We were able to see just how long it took the tech rescue team to get to the job site,” said Harris.

In addition, Washtenaw CRC allowed the team to use its specialized vacuum truck that

can remove water from an excavation site. Olson discovered, “My team can incorporate the vacuum truck to suction out a collapsed trench.”

With both agencies seeing the value of this vacuum truck in a trench collapse incident, Washtenaw CRC volunteered to respond to trench collapse incidents for any municipality or township in the county with its vacuum truck. “They’re another asset to assist us in an emergency,” said Olson about Washtenaw CRC.

The training exercise also allowed both the road commission and the tech rescue team to become familiar with what tools each would have available. “The tech rescue team learned that our crews didn’t have a wheelbarrow on our trailer,” shared Harris about Washtenaw CRC. “We had everything else, but we didn’t have a wheelbarrow at the a job site.”

While Washtenaw CRC has continued providing resources for the tech rescue team’s annual training, the road commission has also gained valuable prevention insights through the partnership. Harris says hosting the trainings has helped them to be more observant of on-site hazards and safety considerations like job-site setup that allow for ease of access in an emergency situation.

“If the tech rescue team ever shows up, we are more able to work together,” concluded Harris, adding that the collaboration with the tech rescue team has enhanced and increased Washtenaw CRC’s awareness of the trench rescue process. “I feel like we’re in a spot where we can hopefully save someone’s life.”

Build Relationships

Harris and Olson believe the best way for local road-owning agencies to start spending an ounce on prevention is by building relationships with their local fire departments and tech rescue team.

Olson says local road-owning agencies should contact their local fire departments and “ask them *do you have capabilities for trench rescue and, if you don’t, who is our closest rescue team that we would call?*”. Harris adds that sometimes tech rescue teams aren’t “necessarily aware of what road commissions do so having some of the fire departments come out to see your processes can help them understand what you’re doing and the depths you’re working in”.

“Build that relationship,” encouraged Olson. “Find out what fire departments and tech rescue teams can offer in terms of training or providing the emergency service and what road commissions can offer in terms of equipment and resources to assist with the rescues.”

Trench Safely

Another way to spend an ounce on prevention is constructing and maintaining trenches that are free of or have mitigated hazards.

OSHA recommends sloping or benching trench walls, shoring the walls with supports, or shielding the walls with trench boxes.² OSHA has repeatedly called attention to tragedies that can occur when these preventive measures are not taken. In its July 2022 news release, OSHA reflected on the narrow 24-foot-deep trench that collapsed in Jarrell, Texas, in June 2022 killing two workers while



Washtenaw County’s technical rescue crew (Photo: Courtesy of Washtenaw CRC)



Top row: Washtenaw CRC's trenching and excavation for culvert installations. Bottom row: Washtenaw County tech rescue team practicing a trench rescue at Washtenaw CRC. (Photos: Courtesy of Washtenaw CRC)

"[t]rench shields, which could have saved their lives, [sat] unused beside the excavation".

And, in April 2022, OSHA issued multiple citations for an Austin, Texas contractor that sent two workers back into a trench that had partially collapsed earlier in the day. The uninspected trench, which had no protective system in place, subsequently collapsed, claiming the life of one of the two workers.³

Olson reiterates the importance that OSHA places on sloping, shoring, and shielding trench walls, saying, "Have a trench box available and in the hole while the crews are working so that they are protected."

Beyond OSHA's "slope it – shore it – shield it" practices for safe trenching, Olson recommends that local road-owning agencies "make sure that vibrations are reduced from around the area". These vibrations can come from traffic and machinery running on the surface, he notes. If possible, closing the roadway and keeping crew members out of the trench while machinery is running can help prevent vibration-induced emergency situations.

"Keep the spoil pile farther away from the lip of the trench," Olson suggested. Doing so means there's "one less thing adding pressure to the trench wall".

Also, according to Olson, water is a significant hazard since it softens and erodes soils.

"Keep flowing water out of the area or de-water the trench if it has water inside," he advised.

Finally, he says making sure utility lines are "secure and out of the way" or, if necessary, that utilities are shut down can keep crews working in or around trenches safe.

Encourage Training

Harris justifies spending an ounce on prevention in the form of training, saying, "I'd much rather train somebody and not have to use it than not train anybody and have to use it."

He emphasizes the importance of "training as many people as you can". Washtenaw CRC trains everyone from its frontline crew members to its operators and foremen, a practice that Harris says encourages "crew buy in". And, he believes that a "well-trained group" means "everyone is looking for hazards" and employees are "more willing to speak up".

Furthermore, Harris sees a value in "smaller trainings outside of the box like trench and rescue, trench and excavation", trainings that he says address "huge hazards" and are "overlooked at times".

Resources for training include the Michigan Local Technical Assistance Program; Dustin Brighton, who works for Bay Community College and offers a variety of safety training for Michigan's road-owning

agencies; the University of Cincinnati, which has offered trench safety trainings in the past; and even community colleges.

Having employees trained to be qualified resources on site is also important, says Harris.

A Pound of Cure

Harris doesn't regret spending an ounce on prevention. For him, it's worth a pound of cure: "I try to protect as many employees as we can and, at the end of the day, if there's someone trained on that site and it saves somebody from jumping in a collapsed trench, we've done our job." ■

RESOURCES

1. Occupational Safety and Health Administration. Alarming rise in trench-related fatalities spurs US Department of Labor to announce enhanced nationwide enforcement, additional oversight. OSHA National News Release, U.S. Department of Labor, July 14, 2022. Available: <https://www.osha.gov/news/newsreleases/national/07142022>
2. Occupational Safety and Health Administration. Trenching and Excavation. U.S. Department of Labor, n.d. Available: <https://www.osha.gov/trenching-excavation>
3. KVUE Staff. Worker fatally injured after Austin contractor ordered them to return to collapsed trench, OSHA says. KVUE abc, 22 April 2022. Available: <https://www.kvue.com/article/news/local/worker-fatally-injured-collapsed-trench-osha/269-36e4df3c-a33d-49b3-961a-69665b28b121>

Epoxy Injection Rig (continued from page 1)

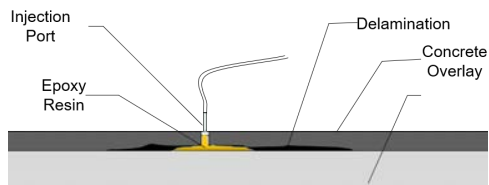


Diagram of epoxy injection into a delaminated pavement (Image: Courtesy of MDOT)

► potholes or spalls”. Once Porter and Graves determine one of these identified bridges to be a candidate, they visit the site and inject the voids with epoxy. They use different injection processes depending on the type of structure and the repairs needed. Porter and Graves have also been applying epoxy injection techniques to concrete I-beams and box culvert walls.

“We also do a lot of polyurethane grouting work inside concrete culverts to stop erosion,” added Porter, who uses the material in an injection process to stop water penetration or to stabilize soils. Polyurethane foam can also be used for slab jacking, which treats differential settlement in underlying soils.⁴ This treatment is often applied to bridge approaches that have shifted due to settlement or erosion due to voids in its structure. By drilling injection holes through the pavement, polyurethane material can be carefully injected into the underlying soil to raise the pavement to its desired profile.⁵ This process can be manipulated to increase the load bearing capacity of a pavement. Polyurethane grouting benefits pavements by lifting previously-settled areas, stabilizing soils, and creating an effective sealant.

Knowledge Drives Innovation

Working with epoxy versus polyurethane requires different tools in order to complete the various types of repairs. Therefore, Graves and his crew initially had to haul tools specific to each repair site in the back of a work truck, a method that lacked organization and limited the work they could do on any given trip. He added, “It wasn’t easy to work on repairs because our tools were not in one place.” Plus, after each job, the tools were taken back to Lansing, unloaded, and sorted, before starting the process all over again. The two quickly realized they needed a better way to manage their tools and supplies.

So, Porter and Graves thought about what they learned in Iowa regarding epoxy treatment techniques and their needs, and how they could “streamline” their process. And, in 2013, Graves began piecing together a tool for their tools—or what they call an “epoxy injection rig”.

Built inside a 16-foot trailer, the rig had a little plug-in air compressor, corded drills, two vacuums for cleaning out cracks and drill holes, and a small toolbox. The rig had eight gear-driven pumps that were placed on dollies and wheeled into position for injection. These small, corded, electric pumps relied on a gravitational pull that Graves describes as a “siphoning” effect to fill cracks and voids with epoxy.

The rig was able to hold a number of small five-gallon pails that contained either epoxy or polyurethane, depending on the planned treatment. “We use minimal materials with crack injection, but we use hundreds of gallons with deck injection,” explained Porter. Because of space constraints, the original rig did not allow for the transportation of both types of treatment materials. Therefore, Porter and Graves used to stage the materials: if they were scheduled to work on multiple bridges in the same area, they would ship the materials to one of the nearby MDOT regional crews. After every deck repair, the trailer had to be restocked with epoxy or polyurethane material.

While the suite of tools built into and available on the rig was making it easier for Porter and Graves to haul and use their tools, they still needed crew members to carry epoxy in pails from the rig to fill the pumps. “Originally, we had two pails of epoxy that were set on dollies with the gear-driven pumps,” Graves recalled, saying that their early setups accommodated between two and ten gallons of epoxy at a time. “We were running non-stop to fill the pumps,” Graves continued. “We also had a mix head with a rubber cap on it that had to be held by hand up to the crack to do the injection work.”

Aside from the equipment setup requiring dedicated crew members, the small size of the rig meant there was limited space for tools for repair jobs. Graves said, “If something broke, I could try to fix it at the site but, a lot of times, we had to go back to Lansing to fix it.”

Innovation Drives Productivity

These constraints spurred successive iterations of the rig. Graves said, “It kept improving,...changing, and getting bigger”. But, not just bigger—these successive rigs would make Porter and Graves’ workflow more efficient and improve their productivity.

The current iteration is a 24-foot trailer. Inside are two generators that run an air compressor, making the rig self-sufficient; and

a small space heater. The rig has rods, chains, and hammers used for “sounding the deck” and identifying the delaminated areas, which allows Graves and the roadwork crew to know where to administer the epoxy injection.

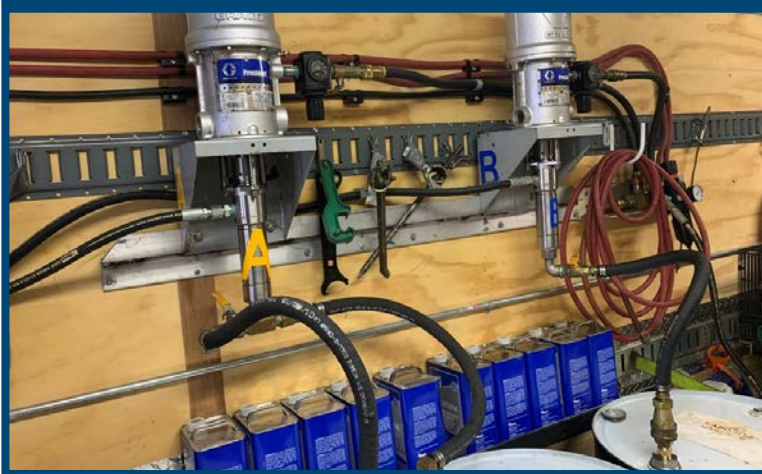
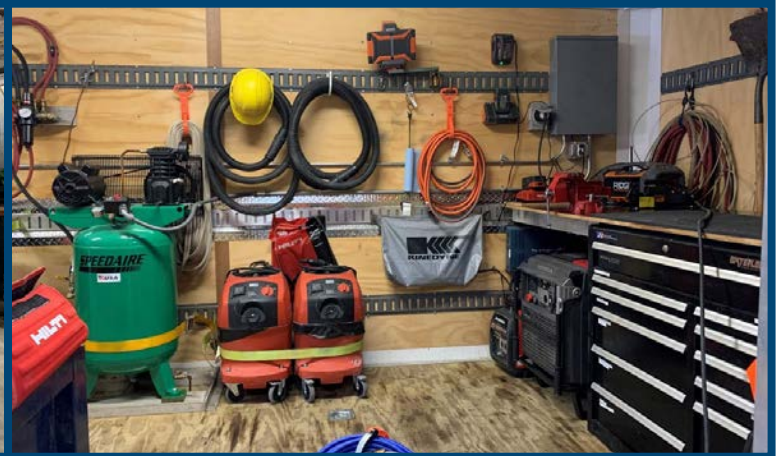
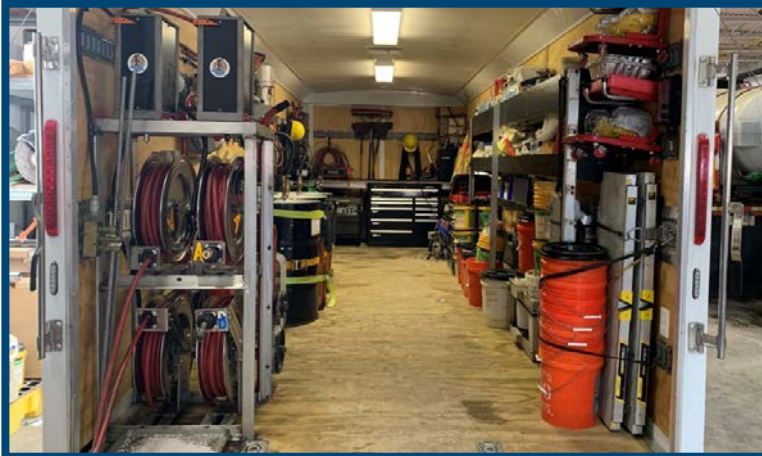
Hammer drills and vacuums are used to set ports to the depth of delaminations. “The drills have special bits that hook up to a vacuum system,” Graves detailed. He notes that the vacuum removes dust from the drill holes while drilling, thereby keeping the holes clean. Plastic ports are placed through these holes, connecting the surface to the hollow below. For cracks, ports are glued over the crack and the rest of the crack is sealed.

The ports allow for the epoxy to be injected by way of 50- and 75-foot hose lines that extend from drums of epoxy on the trailer to the ports on the deck. At any given time, the rig has approximately 300 to 400 gallons of epoxy stored in 55-gallon drums on board. These drums remain on the rig while the transfer pumps feed the epoxy into injection pumps. Both pumps are air powered, capable of up to 3,000 pounds per square inch (psi) of pressure thus allowing the epoxy to be injected at 60 to 80 psi.

Having these newer air-powered pumps has increased the efficiency and effectiveness of the crews’ work. “The material is fed right through the new pump system into the hoses, mixing valves and ports on the deck so we don’t have to worry about air in the lines, off-ratios, or the like,” explained Graves. Plus, since the pump lines attach to the ports via couplers, there’s no more need for a crew member to hold the mix head in place. “Since we can stretch out the hoses, we just keep pulling the rig forward, and drilling, setting ports, and injecting as we go, and we’ve become efficient at doing that,” Graves concluded. “Overall, it’s a very good process, and we’re getting better results.”

The newest iteration of the rig also contains specialized equipment for polyurethane grouting and injection. Most notably, Porter says that they use “paint sprayers that Cliff revamped into polyurethane injection pumps”. Instead of using the long-end spray nozzle, they use a ball valve and pressure gauge that connects to a grease zerk quick coupler, explains Porter. These modifications allow for easy attachment to the drums of polyurethane and for a high polyurethane flow rate.

But, tools for their treatment techniques are not all that the new rig has. The current rig has a full workbench with vises and a



Inside views of the epoxy injection rig built by Porter and Graves and used to transport tools and material for epoxy crack and deck injection and polyurethane sealing. Top Left: Back end of trailer with injection pumps on left. Top right: Front end of trailer with workbench. Bottom Left: Transfer pumps. Bottom Right: Views of injection pumps, transfer pumps and drums, and workbench. (Photos: Courtesy of MDOT)

Outside view of the epoxy injection rig, built in 24-foot trailer (Photo: Courtesy of MDOT)



“big” tool box plus lots of spare parts. Integrating these tools into the rig has allowed Graves and his team to repair anything on-site and, consequently, to go to more sites in one trip. “We can leave for a couple of weeks with everything we need and travel the state,” explained Porter. “There’s no need to return to Lansing for repairs or supplies.”

Even the trailer’s layout is set up with “convenience” in mind, according to Porter and Graves. Every tool is placed in an optimal location based on weight, size, and work process so treatments can be done as efficiently as possible. “We work out of the back of the rig,” explained Porter. “So, the pumps and hose reels are right at the back where we can grab those tools and pull them out on the deck.” Graves added, “The workbench and tools are up at the very front right next to the side entrance door, so I can reach in from the side door and open up the toolbox and get out tools without even having to get in the trailer.”

Porter calls their invention “a mobile shop” and says the rig is “another tool in the

toolbox”. While the rig is the “only one” in the state of Michigan, Porter and Graves helped bring this tool to Indiana where the Indiana DOT developed their own version.

The ways in which the rig has transformed Porter and Graves’ epoxy injection processes has also resulted in cutting time and costs associated with these treatments and making it possible for Graves and his MDOT team to repair more structures than ever before.

For example, they have been able to replace the week-long process of hauling pails of epoxy to the gear-driven pumps with an automated combination of transfer pumps and the air pumps, creating a “much faster and better quality” workflow, according to Graves. “We can go do a bridge with this rig in two days rather than having a whole crew out there for a week, which saves a lot of money in labor costs,” he said.

Porter summed up, “We’ve become more efficient with this whole process.” Graves affirmed, “The efficiency is 100 percent more

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Epoxy Injection Rig (continued from page 7)

▶ than what we used to do.” In fact, Graves says they work with this rig “non-stop” for the majority of the warm months as they travel the state addressing structural issues on Michigan’s road and bridge network. He added, “A lot of times, we work from sun up to sundown to get a bridge deck done so we can minimize the impact on traffic.” The rig has “streamlined everything” Porter and Graves do with epoxy and polyurethane treatments.

Productivity Drives Economic Growth

Roads and bridges play a huge role in economic growth when they allow for effective and efficient movement of people and goods. As part of ensuring an effective and efficient good road and bridge network in Michigan, Porter and Graves’ innovative rig is being used to “save some bridge decks before they get to the point where there are potholes or spalls”, according to Porter.

In fact, the epoxy injection rig is making low-cost treatments available to local agencies. For example, a conventional deck patching job on a bridge can cost upwards of \$42,000 whereas repairing with epoxy is only about \$34,000. Aside from its lower cost, epoxy deck injection can also extend the life of a bridge deck as much as ten years, according to Porter. With that cost-benefit difference, investing in the rig has been worthwhile for Porter and Graves.

Additionally, Porter and Graves epoxy injection rig has enabled them to perform epoxy injection and polyurethane grouting treatments more efficiently, which translates to less downtime for traffic and a benefit for Michigan’s economy. Being able to work more efficiently also means they are able to perform more bridge repairs around the state with less resources expended.

For local agencies interested in epoxy injection or polyurethane grouting, Porter says candidates can be identified by looking for structures experiencing delamination but with minimal spalls and a good underlying deck. Those agencies with qualifying structures are scheduled for assistance in coordination with other on-site visits being conducted in a region or area. Local agencies receiving assistance from Porter and Graves only need three people available to help Porter and Graves with the injection and adequate traffic control measures in place. With Porter and Graves’ expertise and the epoxy injection rig at their disposal, local agencies can tackle delaminated structures with greater speed,

accuracy, and long-lasting results. Interested agencies are encouraged to contact Aaron Porter at Portera@michigan.gov or Cliff Graves at GravesC1@michigan.gov.

The Calculus of Innovation Summed Up: Michigan’s Great Ideas Challenge

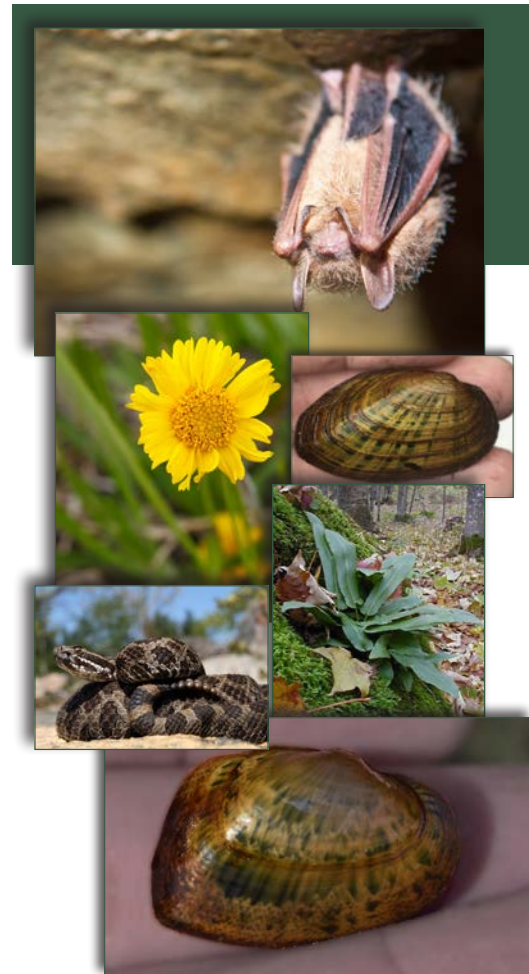
Great ideas are critical to success, but executing the idea is what sets an individual apart. “We’re always on the lookout for new innovations, new materials, and new procedures,” shared Porter. “We test a lot of materials and techniques for bridge maintenance and, if it works well, then we’ll implement it.” Porter and Graves’ tool for managing tools—their epoxy injection rig—is a great idea that has transformed the way injection processes are done in Michigan and played a pivotal role in maintaining road and bridge structures.

But, getting to the point of having that innovation was the result of much collaboration and idea sharing with others at Iowa DOT and Indiana DOT. “We learned a lot from them, and I think they learned a lot from us,” said Porter. Graves also credits his MDOT supervisor who encouraged his innovation by giving him “free reign” when developing each rig.

Within Michigan, the Michigan LTAP’s Great Ideas Challenge is an idea-sharing platform for innovations. For those looking to become innovation drivers, Porter recommended, “Do some research, reach out to others who are doing the same processes, spend a little time seeing what everybody else is doing

RESOURCES

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Tri-colored bat^a, lakeside daisy^a, snuffbox mussel^b, American’s hart-tongue fern^c, Eastern Massasauga rattlesnake^a, snuffbox mussel^b (Photos: Courtesy of a-Shutterstock, b-Jeff Grabarkiewicz, MDOT, c-USDA)



Funding Opportunity!

The FHWA’s Wildlife Crossings Pilot Program (WCPP) is a competitive grant program with the goal of reducing wildlife vehicle collisions (WVCs) while improving habitat connectivity for terrestrial and aquatic species.

To that end, this grant will fund construction projects (e.g., engineering, design, permitting, construction, right-of-way acquisition, and other infrastructure-improvement activities) as well as non-construction projects (e.g., planning, research, and educational activities).

Applications must be submitted electronically through [Grants.gov](https://www.grants.gov) no later than 11:59 p.m. ET on August 1, 2023. Learn more at <https://highways.dot.gov/federal-lands/programs/wildlife-crossings>.

Working with Wildlife

Insights and Resources for Working Around Threatened and Endangered Species

Minnesota Local Technical Assistance Program & Center for Technology & Training

When engaging in road and bridge work, local road-owning agencies are likely to encounter wildlife like vulnerable fish and aquatic life and threatened and endangered animals, insects, and plants.

Creating fish-friendly culverts is one way to protect vulnerable fish populations from becoming threatened or endangered. Here are some insights and strategies from the Minnesota Department of Transportation for working with wildlife encountered during construction and maintenance work.

Minnesota Researchers Offer Guidance for Fish-friendly Culverts

—By Sophie Koch, MnLTAP freelancer

Designing infrastructure to handle the impacts of climate change is becoming a priority for transportation agencies. Culverts are one example. Road-stream crossings are critical not only for roadway safety and longevity but also for fish and other aquatic organisms that need to move through a stream network.

“Maintaining habitat connectivity throughout a stream is important to threatened populations, because isolated populations—where fish can’t pass through culverts—can be particularly vulnerable to climate change impacts,” says Jessica Kozarek, research associate with the St. Anthony Falls Laboratory (SAFL) at the University of Minnesota Twin Cities campus.

Overly warm waters, or low water or drought, can make part of a stream uninhabitable for its local fish populations. In such situations, fish are more likely to survive if they can move and take refuge elsewhere, Kozarek says.

A variety of factors, however, can prevent fish from passing through a culvert. The barriers might be physical, such as steep drops that fish can’t jump over; fast water with no resting areas; or very shallow water. The barriers can also be behavioral: Lack of light, habitat, or cover can make fish unwilling to enter a culvert. These factors vary from one species of fish to another, Kozarek explains, which makes it difficult to create designs that accommodate all species.

SAFL researchers have been working toward the overarching goal of improving stream connectivity at road-stream crossings. Research has involved a range of smaller-scale

projects with various partners, including several sponsored by the Minnesota Department of Transportation (MnDOT) and the Minnesota Local Road Research Board (LRRB).

An ongoing project by Kozarek and fellow SAFL research associate William Herb aims to evaluate culvert designs in relation to local stream flow and fish passage data. The researchers surveyed 50 culverts across Minnesota, recording data related to culvert design and local stream channel characteristics.

They also compiled swimming criteria for fish species in the state. The research team then used computer models to estimate stream flows for present and future climate conditions and the corresponding water velocities and depths in the culverts. These models generally found that climate change will hit differently across the state, Herb says. Summer low flows, which can create depth barriers in culverts, stand a particularly high risk of changing in the future.

The study supports the current consensus for culvert design practices that recommend mimicking the structure of the natural streambed and maintaining continuity of sediment transport and debris passage, Kozarek says. Using this approach, a culvert should match or exceed the channel width, consider channel alignment and slope, and provide similar water depth and velocity as the natural channel.

It should also be embedded in the streambed and include sediment to mimic the natural roughness of the channel.

“You eliminate the need to evaluate culvert velocities and the specific swimming abilities of individual fish species and life stages,” Kozarek says. “If the fish can swim through the channel itself, [they] can likely move through the culvert as well.”

These more connective culvert designs are typically larger and therefore involve a higher up-front cost, Kozarek notes. However, the research has also found a parallel between ecological connectivity and flood resiliency, since these culverts can

more readily handle both high and low flows.

“Culvert designs that can adapt are more resilient to future climate scenarios,” Kozarek says.

Learn more:

- *University of Minnesota’s Center for Transportation Studies webinar “Reducing Climate Change Impacts in Minnesota”*: cts.umn.edu/events/seminars/2021/climate
- *Minnesota Guide for Stream Connectivity and Aquatic Organism Passage Through Culverts (Mn-DOT/LRRB, 2019)*: <https://conservancy.umn.edu/handle/11299/202652>

Reprinted and adapted with permission from: *Minnesota LTAP Technology Exchange*, March 2022.

Download a free poster of Michigan’s freshwater mussels from Michigan State University Extension:
<https://mnfi.anr.msu.edu/publications/books>

Minnesota DOT Studies Ultrasonic Devices to Deter Bats During Bridge Repair

—By Minnesota LTAP

Bridges attract bats, which like to roost in expansion joints. Temporarily preventing such roosting requires physical barriers that are difficult to establish effectively on many bridges. More importantly, Minnesota Department of Transportation (MnDOT) does not necessarily want to keep bats away permanently because bat populations throughout the continent are in serious decline.

In a recent project, researchers examined the use of ultrasonic deterrence devices developed for use with wind turbines to determine how feasible and effective they may be at temporarily deterring bats at bridge sites.

Bats in Danger

White-nose syndrome, a fungal disease, has killed more than 5.7 million bats in eastern North America since 2005. Wind turbines kill hundreds of thou-

► continued on next page

Did You Know?

Michigan agencies have been collaborating to “replace undersized culverts with timber bridges” in an effort to “remove blockages to natural water flow in streams and rivers”. Learn more at: <https://www.usda.gov/media/blog/2023/04/05/restoring-michigans-aquatic-ecosystems-through-regional-conservation>

► sands of bats in North America each year, according to the US Geological Survey. Habitat loss has been another deadly influence on bat populations. In 2015, the US Fish and Wildlife Service listed the northern long-eared bat, a species familiar in Minnesota, as threatened.

Regulatory requirements that protect bats also shorten maintenance period options during the construction season. Crews must avoid any bats present, which affects cleaning, painting, or other maintenance work. The presence of bats disrupts bridge work timelines and budgets, and work upsets habitation for species struggling to survive.

Test sites and set-ups

In 2019, researchers worked with the project's technical advisory panel, the Minnesota Department of Natural Resources, and the US Fish and Wildlife Service to select two bridge sites for testing the ultrasonic deterrence devices. At each site, the research team installed four battery-operated echolocation recording devices to monitor bat activity before, during, and after the use of deterrence devices.

The first site was in the Red Wing, Minnesota, area on US Highway 61. Researchers set up generator-powered ultrasonic deterrence devices on six tripods 25 to 30 feet away from the north abutments; the devices were aimed at areas beneath or near the bridge deck.

The second site, a single-span bridge on State Highway 43 near Rushford Village, entailed seven beam-mounted deterrence devices hanging 20 to 25 feet from and mostly facing the abutment on the south side of a small creek.

Bats stayed away—but came back

At both sites, the devices worked well at keeping bats away until they were turned off, at which point bats quickly returned. Acoustic data showed few bat calls while deterrents were running, and, more importantly, site visits during deterrence definitively confirmed an absence of bats.

Species distribution was similar at both sites, with a large number of calls by little brown bats followed by big brown bats at site one; at site two, big brown bats composed the largest group, and little brown the second largest. Other common Minnesota bat species

Did You Know?

Adapted from MnDOT's Bats and Bridges web page

White nose syndrome has become a threat to hibernating bats. It appears on the muzzle and other parts of the bat during hibernation. Bats with white nose syndrome act strangely during winter months and tend to exit their habitat and fly outside.

were also detected at the sites.

"This project was innovative," says Christopher Smith, wildlife ecologist with the MnDOT Office of Environmental

Stewardship. "We worked with a technology that wasn't really on the market yet for real-world applications in anticipation of its availability."

Learn more:

- *Use of Innovative Technology to Deter Bat Bridge Use Prior to and During Construction (MnDOT, Oct. 2021): <https://www.dot.state.mn.us/research/reports/2020/202026.pdf>*

Reprinted and adapted with permission from: Minnesota LTAP Technology Exchange, June 2022.

Why It Matters for Michigan Agencies

Michigan is home to several threatened and endangered mammals, birds, reptiles, clams, flowering plants, insects and ferns. Some of these species are common in areas where road and bridge construction and maintenance occur.

For example, the Indiana bat and northern long-eared bat, both endangered, as well as the tricolored bat, proposed as endangered, find bridges to be hospitable roosts. Clams and mussels like the clubshell, northern riffleshell, rayed bean, and snuffbox have been known to make a home on bridge structures. The endangered Hungerford crawling water beetle is known to exist only in four Michigan locations and one Ontario location, all being cold-water, alkaline streams; however, at one of the four Michigan locations, road erosion has reportedly led to its disappearance there. Finally, two endangered reptiles species and seven types of endangered flowering plants and ferns can be found in fields and forest across Michigan.

Agencies can familiarize themselves with threatened and endangered species in their area using the U.S. Fish and Wildlife Service's Information for Planning and

Find threatened and endangered species near you with the U.S. Fish & Wildlife Service's Information for Planning and Consultation (IPaC) tool: ipac.ecosphere.fws.gov

Consultation (IPaC) tool. They can also find resources on the Michigan Department of Transportation Local Agency Program's NEPA (National Environmental Policy Act) Guidance page, <https://www.michigan.gov/mdot/business/local-government/local-agency-program/guidance-documents>. ■

What Can You Do?

Adapted from MnDOT's Bats and Bridges web page

Bats use a variety of habitats for day and nighttime roosts, including trees, caves, and man-made structures such as bridges and buildings. Future regulations may require incorporation of conservation measures in bridge projects to minimize impacts to bats.

If I encounter a bat, what should I do?

Leave them alone:

- Bats will not attack, and pose very little risk, unless harassed. Many bites occur when people are attempting to capture or kill them.
- If you are bitten, seek medical attention immediately. The Centers for Disease Control and Prevention notes that bat bites are medically urgent, though not emergencies.
- Bats can carry rabies, which humans rarely survive once symptoms set in. Symptoms can set in within as few as nine days.

Document them:

- Take photos.
- Record a detailed description of location.
- Record the date and time of observation.
- Send documentation to the state's wildlife ecologist.

What indirect signs of bats might I encounter?

- Droppings (guano)
- Urine staining
- Chirping/chattering

Is it likely that I will see many bats?

No. Most bats prefer closed spaces, such as caves. Bats that reside on bridges will typically use the same bridge for their 20- to 30-year life span.

Learn more:

- *MnDOT Bats and Bridges page: dot.state.mn.us/environment/bats*

Reprinted with permission from: Minnesota LTAP Technology Exchange, June 2022.

Michigan.gov has many resources about bats here: <https://www.michigan.gov/dnr/education/michigan-species/mammals/bats>

New Minimum Retroreflectivity Standards Take Effect

Steven Strength, PE, *Director*
Louisiana LTAP

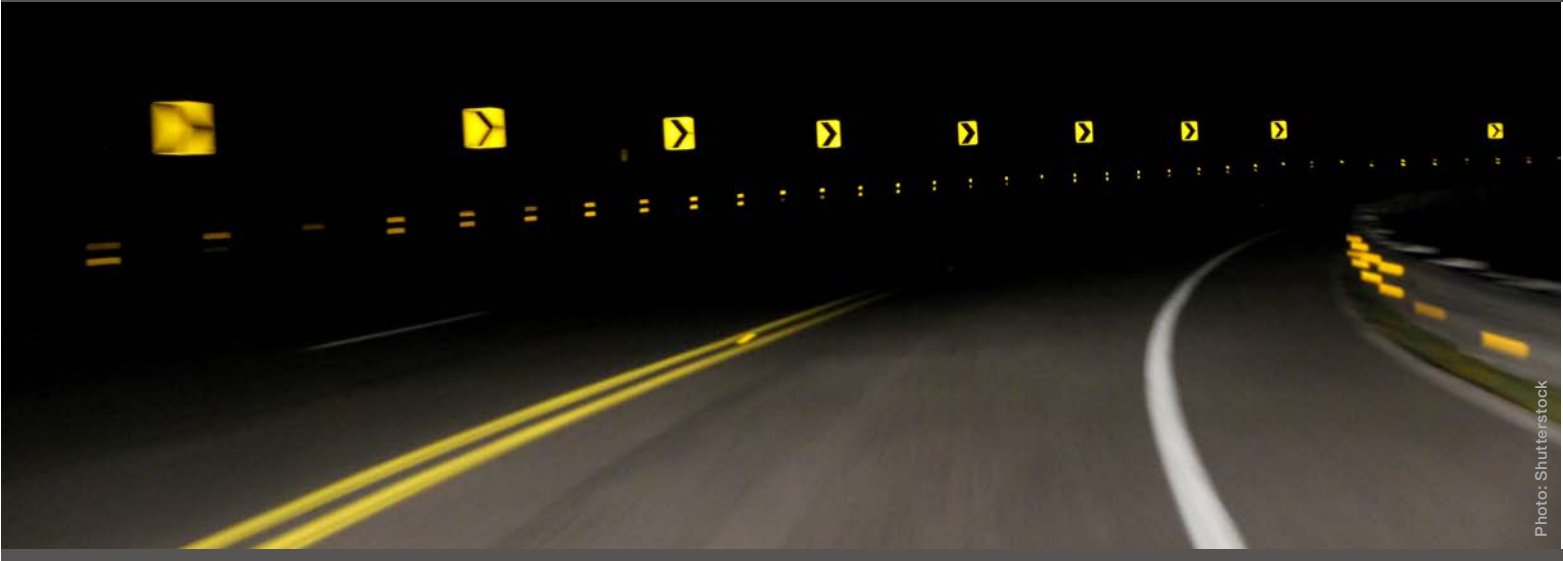


Photo: Shutterstock

Even with the 2009 Manual on Uniform Traffic Control Devices (MUTCD) scheduled to be superseded by the new 11th edition in the spring of 2023, Revision 3 of the 2009 MUTCD, dealing with Minimum Retro-Reflectivity of Pavement Markings, has been published with an effective date of September 6, 2022. The new regulation includes a compliance date of four years from adoption, which will be 2026; therefore, these standards are expected to be incorporated into the MUTCD 11th edition as well. In a webinar on September 1, the FHWA Resource Center outlined the new standards, contained in Section 3A.03 of the revised manual.

The new standard states in part that “Except as provided in Paragraph 5, a method designed to maintain retroreflectivity at or above 50 mcd/m²/lx (50 millicandelas per square meter per lux) under dry conditions shall be used for longitudinal markings on roadways with speed limits of 35 mph or greater.” The mcd/m²/lx is a commonly used measurement of the light reflected back to a light source from a retroreflective surface. The regulation goes on to recommend that “a method designed to maintain retroreflectivity at or above 100

mcd/m²/lx under dry conditions should be used for longitudinal markings on roadways with limits of 70 mph or greater.”

The most notable exception in paragraph 5 of the standard specifies streets or highways with average daily traffic (ADT) volumes of less than 6,000 vehicles per day; therefore, most locally owned roads would not be subject to the new rule, nor will curb markings, dotted extension lines, or shared use paths. Additional exclusions apply to transverse markings; word, symbol, and arrow markings; crosswalk markings; and various diagonal markings such as chevrons.



Testing the retroreflectivity of a sign using a reflectometer (Photo: CTT Archive)

For longitudinal markings on roadways falling under the new rule, FHWA has published guidance for assessing and maintaining the minimum levels for pavement markings, similar in nature to those suggested in the MUTCD for signs. These might include direct measurement using a handheld or mobile retroreflectometer, nighttime assessment using

trained older driver inspectors (aged 60 or higher), comparison to calibration markings, expected service life based on evaluation of “similar” markings in service, or a combination of methods. Several supplemental resources have been published by FHWA providing guidance on the new standards and the various methods for maintaining compliance.

Details of the new standards are available on the FHWA website at www.fhwa.gov/retro and at https://safety.fhwa.dot.gov/roadway_dept/night_visib/pavementmarkings.cfm. The complete 2009 MUTCD with Revisions 1, 2, and 3 is available online at <http://mutcd.fhwa.dot.gov>. ■

Reprinted from Louisiana LTAP Technology Exchange, volume 34, issue 3 with permission. Available: https://www.ltrc.lsu.edu/ltap/pdf/v34_n3_web.pdf.

Michigan’s LTAP provides local agencies the option to borrow a Delta@RetroSign GR3 retroreflectometer.

A retroreflectometer is a useful tool for maintaining sign retroreflectivity at required levels. Local agencies can borrow the equipment for a period of up to two weeks at no cost, however borrowing agencies are responsible for shipping and insurance.

Learn more at: <https://michiganltap.org/retroreflectometer-loan-program>

Two Resources for Local Agencies

Connecticut T2 Center & Center for Technology & Training

Local agencies can find two useful safety resources recently released by the Federal Highway Administration.

Rural Roadway Departure Countermeasure Pocket Guide

—By Melissa Evans, Connecticut T2 Circuit Rider

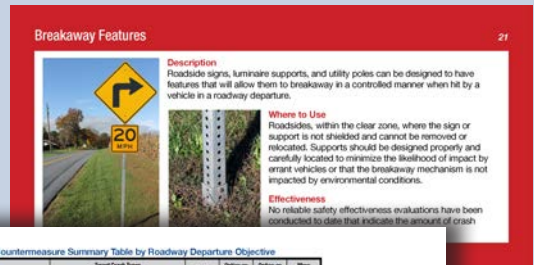
As part of the ongoing work to reduce rural roadway departures across the country, the Federal Highway Administration has developed a Rural Roadway Departure Countermeasure pocket guide. This guide (found at <https://safety.fhwa.dot.gov/FoRRRwD/RwDPocketGuide.pdf>) provides local agencies with a quick reference for identifying possible countermeasures for various issues they may identify in the field. It is meant to be a hands-on approach to reducing roadway departure crashes and can be distributed to those employees who work on your local roads daily, to assist them in making your roads safer.

The guide is organized into three color-coded sections, which align with the proven countermeasure categories—keeping vehicles in lane, reducing potential for a crash, and minimizing severity. Also included is a graph that identifies the countermeasures within each section and provides information on whether that solution is a low, medium or high cost.

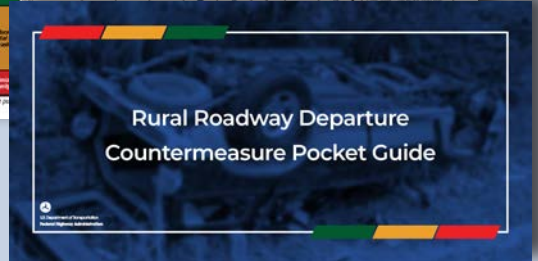
By implementing these countermeasures local agencies can reduce this number and get closer to our goal of zero deaths on our roadways.

Additional information on roadway departure safety can be found on the FHWA website at https://safety.fhwa.dot.gov/roadway_dept/.

Reprinted with permission from Connecticut Training & Technical Assistance Center CT Crossroads Newsletter, Nov. 2021. Available: https://www.cti.uconn.edu/cti/T2_CT_Crossroads.asp.



Objective	Countermeasure	Target Crash Type				Cost (\$/ft)	Sign on Street?	Sign on Shoulder?	Sign on Roadside?	More Info Page
		Head On	Side Swipe	Road Depart	Curve					
Keep Vehicles in Lane	Edge Line Markings	●	●	●	●	L	✓		1	
	Center Line Markings	●	●	●	●	L	✓		2	
	Curve Warning Signs	○	○	○	○	L	✓	✓	8	
Reduce Severity	Shoulder Runoffs	○	○	○	○	L			10	
	Center Line Runoffs	○	○	○	○	L			11	



Cover and example pages from the FHWA's Rural Roadway Departure Countermeasure pocket guide

Roadway Lighting Resources

Did you know that approximately 75 percent of pedestrian fatalities nationwide occur when it's dark, according to the National Center for Statistics and Analysis (2018 data)?

A Virginia Tech Transportation Institute study of rural intersection lighting found that “a 1 lux increase in lighting level can reduce crashes by as much as 9%”.¹ Similarly, the research report *Street Lighting for Pedestrian Safety* found that “detection distance [of pedestrians] increased as light level increased” in unfamiliar situations.² That report also found that the “optimal semi-cylindrical illuminance was 9 lux” as less than that “yielded shorter detection distances” and more than

that had “limited benefit”, and that “urban versus rural environments warrant two different lighting designs to enhance the visibility of pedestrians” since urban areas required more luminance to help identify pedestrians in the midst of visual clutter.²

According to the FHWA, roadway lighting at intersections can reduce nighttime crashes on highways resulting in injury by 28 percent, at intersections by 38 percent, and at intersections with pedestrian involvement by 42 percent.³ An example of nighttime crash reduction consequent to improved lighting can be seen in Florida. Florida DOT has been replacing sodium lights with LED lights at crosswalk and intersection locations across

the state.³ LED lights allowed Florida DOT to set the specific color temperature for optimal visibility for drivers.³ Preliminary data has shown Florida DOT's efforts significantly reduced crashes, injuries, and fatalities.³

The FHWA has compile resources for roadway lighting, including a Pedestrian Lighting Primer (2022) to provide transportation practitioners with guidance for effective pedestrian lighting installations. View the primer and access other FHWA roadway lighting resources at https://safety.fhwa.dot.gov/roadway_dept/night_visib/roadway-lighting.cfm. ■

RESOURCES

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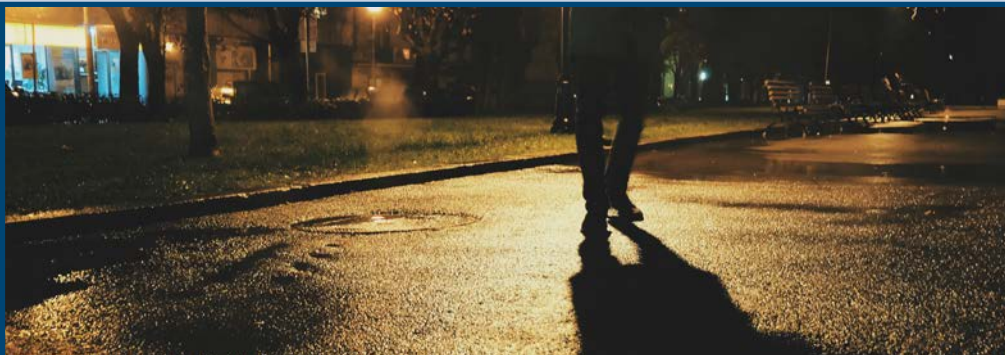


Photo: Shutterstock

Converging Experiences and Skills at a Road Commission: Darrell Cass

Victoria Kaplewski, Technical Writer & Sydney Watilla Sprague, Intern
Center for Technology & Training



Darrell Cass

When Darrell Cass decided to go to Michigan Technological University, about 2.5 hours away from his hometown of Cornell, he entered as an undeclared major. But, it wasn't long before a summer coop experience with the Michigan Department of Transportation (MDOT) "sparked his interest in civil engineering". From there, Cass began gaining a broad range of experiences and skills in civil engineering which, unbeknownst to him, was preparing him for his future role as engineer-manager of Menominee County Road Commission (CRC) and life in general.

Before finishing his university studies, Cass continued to work with MDOT, saying "I built a good relationship with them". He also collaborated closely with well-known professors at that time Kris Mattila, Amlan Mukherjee, and Larry Sutter. "The research that we were involved in was life cycle assessment and environmental impacts of transportation projects," Cass related. In total, Cass earned both a bachelor's and master's degree in civil engineering as well as a graduate certificate in sustainability.

Construction Site Infrastructure Work

After graduating but before ending up in Menominee County, Cass ventured as far as Tennessee and then to Minnesota, all the while cultivating diverse interests and gaining broad experiences. "I think it was Dr. Mattila who gave me information about Fisher Contracting," shared Cass, who set up an interview with the Midland-Michigan-based contracting firm. "Fresh out of grad school, I was approached by Fisher, and that was my first job out of college."

He was assigned to an industrial facility in Clarksville, Tennessee, where Fisher was "doing a lot of the initial site work like earthwork, grading, and underground utilities". Cass shared, "So, I got to go down to Tennessee, get out of the U.P. a little bit, and, expand my horizons, and do some exciting civil infrastructure work." He continued, "As a side note, that's where I met my wife, who was working on the same site."

Around the time that Cass and his wife were looking to relocate nearer to Michigan's Upper Peninsula, Cass was let go from Fisher because manufacturing of the key component at the Tennessee industrial facility was moved overseas. So, Cass moved to Minnesota where he would gain another range of experiences at not one, but four positions at Minnesota Department of Transportation (MnDOT).

DOT and TSC Experiences from Different Angles

"I was familiar with MnDOT's Graduate Engineer Program so I reached out to the director, and they had some openings for new graduate engineers," reminisced Cass. He applied for and joined the MnDOT GEP which, over the next two years, rotated him through different offices in positions of project design engineer, estimator, project engineer, and state-aid engineer. From the GEP rotations, he transitioned into a full-time role in the MnDOT Federal Aid Office as a project manager.

"Of all the experiences with MnDOT, I really liked working with the local agencies—the various cities and counties within Minnesota—and developing relationships with those folks and their consultants," he said. "In a lot of cases, I would work hand in hand with the design consultants they hired

and make sure their plans were compliant with the federal-aid standards." He says he most enjoyed seeing these local agencies get to construct these projects and then seeing their results.

When the opportunity came for Cass to join MDOT, Cass similarly went on to gain experience at not one, but three transportation service centers (TSCs) in Michigan's Upper Peninsula. He assumed the roles of staff engineer at Newberry TSC, senior design engineer at the MDOT Superior Region Office where he worked on design and bridge inspection projects, and assistant construction engineer at Crystal Falls TSC where he was involved in a multi-year bridge project.

"One really interesting project I did with MDOT was assisting with the Newberry TSC's survey and getting all the field data for some roadwork on Mackinac Island," Cass recalled. "For my work day, we would leave the MDOT TSC in Newberry, take a ferry over to Mackinac Island with all our gear, do our survey or work throughout the day on the island, and take the ferry back." The TSC team spent about three weeks surveying and gathering data on M-185. Although Cass transitioned to another TSC position before the roadwork began, he reminisced, "We definitely got to see a lot of the island...it was a cool project."

Looking back, Cass says these different roles allowed him to "experience different facets of transportation and bridge projects, like how state funding works, reviewing local agency materials and projects, and how local agencies work". He reflected, "All of that prepared me to be an engineer manager here at Menominee County Road Commission."

Where Broad Experiences and Skills Converge: CRC Engineer-Manager

"When I worked with the DOTs, I found myself in a certain niche—I was either in construction or design or permitting or else," Cass shared.

All of Cass's different experiences have converged on his current position as engineer-manager of Menominee CRC. "When you're an engineer manager at a road commission, you do it all," he said. "You

► continued on next page

► have the engineering, the permitting, and the environmental issues to deal with, and then there's also the managing side of it—the staffing, the personnel, the Union—the list goes on and on.” According to Cass, being an engineer-manager is a “diverse job” that requires him to “wear different hats”. He pointed out, “There’s no routine day here at the road commission.”

Now, Cass is responsible for managing 1,121 miles of roads and 71 bridges including three interstate bridges, maintaining 197 miles of MDOT trunkline, developing an annual budget, making sure projects are bid correctly and constructed properly, and ensuring legal compliance on contracts.

“I also didn’t realize just how severely underfunded the local agencies are,” Cass continued, “and the need that they have in maintaining their road and bridge network”. He says that the Michigan Transportation Fund (MTF) monies that road commissions receive only cover maintenance like snow/winter operations, grading, dust control, pothole patching, and culvert replacement. “We have a large network of local roads that were paved in the 60s,” Cass added, “and we don’t have funding to resurface or rehabilitate these roads, so we have to try to preserve them as best we can.”

So, Cass has tapped into his broad expertise in networking with state and local agencies to help fund necessary improvements to Menominee County’s road and bridge network.

Improvements to County Road (CR)

551 were made possible by a collaboration between the road commission and the Hannahville Indian Community. According to Cass, the popular “cut across” road between two major highways, US-2 and M-69, needed weight restrictions every spring. The road commission listened to the townships and local stakeholders and undertook the effort to convert CR 551 into an all-season class A road. Cass points out that the Hannahville Indian Community made a “huge contribution” to the project, funding 80 percent of the first 4.4 miles of roadwork. “We never would have got the whole road done without them,” he added. The entire project was about 8 miles that also included a 2.7-mile portion done with federal funding.

Cass also managed to network all 14 Menominee County townships in a gravel road resurfacing effort. When Menominee County received \$4.4 million in ARPA funding that could be used toward roadwork, Cass reached out to the townships: “I said, the county is going to be getting these funds and they are eligible to be used on the road network, and I think we should have a collective effort to approach the county board!” He continued, “We had some meetings with the township officials on how we were going to approach the county board with this request.” So, Cass and the 14 township officials secured a spot on the county board’s meeting agenda and presented a case to use \$1 million for the local road network. The county board’s finance committee gave the local agencies \$750,000,

which could be used towards a project or towards gravel resurfacing.

Cass reflected, “Coming together collectively as a team and approaching the county board and requesting those dollars and seeing how important local roads are to all 14 townships is what made the project successful.”

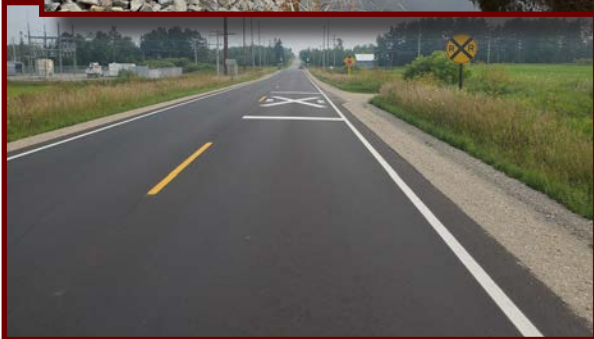
Sharing the Importance of Broad Experiences

For Cass, his diverse interests and broad range of experiences don’t stop at his work desk. “Right now, my free time has been taken up with youth wrestling”, he shared. All his weekends are now consumed with his four children’s sports programs. “Baseball season is right around the corner, so we’ll be getting ramped up for that, soon.”

Cass also helps with coaching, serving as assistant coach for the baseball teams and head coach for the youth football team.

And then, there’s camping. “We like to spend a lot of our family time camping,” he said. His family uses their travel trailer at every opportunity. “We like just getting outside and enjoying the outdoors.” He says their favorite camping trips are up to the Keweenaw.

“One thing my kids love the most is our annual father kid canoe trip in June” he added. “We try to find rustic, primitive type camping areas that teach them valuable skills about survival, and we rough it for three days!” His kids look forward to the trip eagerly. It’s one of Cass’s many diverse interests that he’s sharing with others. ■



Darrell Cass trying a new grader on a gravel resurfacing project. Left top: Newly-constructed precast structure over Devils Creek on No. 29 Road. Left bottom: All-season roadway on County Road 551. (Photos: Courtesy of Menominee CRC)

The Bridge

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About LTAP

The Local Technical Assistance Program (LTAP) is a nationwide effort funded by the Federal Highway Administration and individual state departments of transportation. The goal of the LTAP effort is to foster a safe, efficient, and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision makers.

Steering Committee

The LTAP Steering Committee makes recommendations on, and evaluations of, the activities of Michigan's LTAP.

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Michigan's
Local Technical
Assistance Program

The Center for Technology & Training (CTT) is a part of the Department of Civil, Environmental, and Geospatial Engineering at Michigan Technological University in Houghton, Michigan. The mission of the CTT is to develop technology and software, coordinate training and conduct research to support the agencies that manage public infrastructure. In support of this mission, the CTT houses Michigan's Local Technical Assistance Program, which is part of a national effort sponsored by the Federal Highway Administration to help local road agencies manage their roads and bridges. For more information, visit ctt.mtu.edu.

The Bridge

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Michigan's Local Technical Assistance Program

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Upcoming Events

REGISTER & MORE INFORMATION AT ctt.mtu.edu/training

2023 TAMC Data Collection Training – Summer Sessions

PASER Class 1: August 29 – webinar

PASER Class 2: August 30 & 31 – webinar

2023 HEC-RAS 6.4 Training

August 7 – Lansing

Welding for Maintenance Workers

July 26 – Grand Rapids; August 9 – Escanaba

2023 Updating a Bridge, Pavement, or Compliance Plan Webinar

May 23; August 15

Microsoft Workshops

Microsoft Word: August 16 – webinar; Microsoft Excel: August 23 – webinar;

Microsoft Excel: August 29 – webinar

Engineering Ethics

August 24 – webinar

2023 Culvert Condition Assessment Training Webinar

August 29

2023 Bridge Load Rating

The Basics—From Plans to Rating: August 31; Theory and Policy:

September 14; Virtual Workshop (2-day): September 21-22;

Advanced Topics—Part 1: October 5; Advanced Topics—Part 2: October 24

MARK YOUR CALENDAR: 2023 TAMC Asset Management Conference

September 26 – Grand Rapids

MARK YOUR CALENDAR: 2023 Michigan Winter Operations Conference

October 17-18 – Bellaire

More training opportunities!

Visit ctt.mtu.edu/webinars-and-workshops to learn about other events offered by the Michigan LTAP/Center for Technology & Training

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- Chris Gilbertson, PhD, PE – bridges/structures
- Pete Torola, PE – paved & unpaved road design, construction, maintenance
- Zack Fredin, PE – bridges/structures
- Ingrid Sandberg, PE – geotechnics

Learn more at ctt.mtu.edu
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