

MINNESOTA LTAP TECHNOLOGY EXCHANGE

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Minnesota Local Technical Assistance Program

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Congratulations, Mousetrap winners!



Kudos to Olmsted County Public Works for taking first place in the Inspection and Data Collection category at the National LTAP Build a Better Mousetrap Competition! The county's camera culvert inspection tool (left) also earned second place in Minnesota's Mousetrap contest. First place in our competition went to Rochester for its manhole ring lifter project (right).

Mousetrap continued on page 2

Hands-free law now in effect

Minnesota's new hands-free law applies to all drivers—including employees—anytime, anywhere. It does not matter who owns the phone.

Employees may use their phones while driving, but only in hands-free or one-touch activation mode. No typing or scrolling is allowed while driving or as part of traffic. Hands-free or hand-held is allowed,

however, when there is an immediate threat to life and safety.

The law for commercial vehicle drivers remains the same: hands-free and one touch.

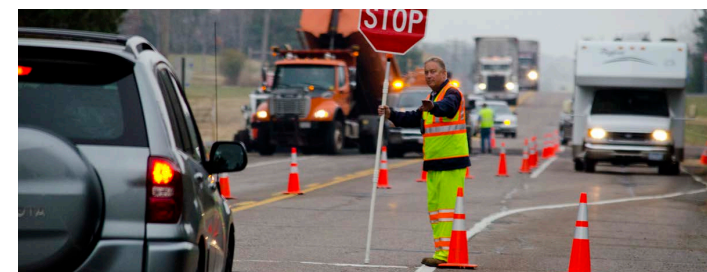
Organizations should update their traffic policies and develop and communicate clear rules and regulations for mobile phones. Employer policies can be stricter than the law.

The website HandsFreeMN.org has a range of resources, including a "Hands-Free How To For Employers" and a list of education ideas for your workplace (see page 5 for a sampling).

Also on page 5, a University of Minnesota expert shares her thoughts about what it means to go hands-free and how it can help reduce distracted driving. ■



HANDS-FREE MINNESOTA LAW
HandsFreeMN.org



New law allows work-zone flaggers to report traffic violators

A new law went into effect August 1 that allows flaggers to report work-zone traffic violators. If drivers ignore a construction zone flagger, they could be ticketed for a work-zone violation whether state troopers are there or not.

According to the revised Minnesota statute, "a citation may be issued even though the violation did not occur in the officer's presence." To do so, a qualified work-zone flagger must provide a report of the violation within four hours of the incident. The report must include a description and the license plate number of the vehicle and the time of the incident.

To be qualified for reporting, a work-zone flagger must have completed training that includes information on flagging operations, equipment, traffic laws, observation and accurate identification of motor vehicles, and delegation of duties involving a report. ■

Learn more:

- Chapter 3 S.F. No. 1753, Minnesota Session Laws - 2019, Regular Session, Office of the Revisor of Statutes

READ THE **EXCHANGE**

online for links to publications and other resources.



TECHNOLOGY EXCHANGE
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HONORS

Mousetrap from page 1

"This is a great competition that energizes our team to come up with new and innovative ideas to work more efficiently and safely," says Chris Petree, Rochester director of public works.

This year, Minnesota also had runner-up projects from Crow Wing County and Douglas County. Our thanks to all these agencies for submitting their excellent projects!

The Minnesota competition is sponsored by the Minnesota Local Road Research Board and administered by Minnesota LTAP. Our top two submissions are forwarded to the national competition in June, and recipients in four categories are announced by the National LTAP Association in July/August.

City of Rochester—manhole ring lifter

Problem: The city's Public Works Department rebuilds all manholes (about 500 per year) needing repairs and replacement during street improvement projects. During this process, employees stand on the street and remove concrete rings with jackhammers before manually lifting the broken pieces to street level. This work involves hours of extensive bending and lifting. Additionally, the task of cutting and jackhammering concrete rings exposes crews to silica dust.

Solution: The manhole ring lifter, a hydraulic lifting device that is attached to a crane on a truck, was designed to mechanize the removal of concrete rings. The lifter is first lowered by the crane into the manhole; then, a set of wings are extended to dislodge the ring and lift it to the surface of the street. This device eliminates the need for jackhammering and the manual labor of bending and lifting.

Olmsted County Public Works—360-degree camera culvert inspection

Problem: Olmsted County has over 1,600 center-line culverts that need to be inspected and maintained. To eliminate the need for staff to manually crawl through culverts, the county wanted to build a remote-controlled car similar to MnDOT's HIVE. However, there were some concerns about the HIVE design that the county wanted to improve upon to better serve its needs and systems.

Solution: The county constructed two sleds out of PVC piping, one of which includes floats for culverts containing water. The sleds each hold a 360-degree waterproof camera and lights, and they can be pulled through culverts with reel-mounted fiberglass fish tape. The camera records the whole culvert during the inspection, which allows staff to



Submit your ideas for the 2020 Mousetrap competition!

As you work on projects throughout the year, please keep the 2020 contest in mind. We want to hear about your agency's creative solutions, and submissions are welcome at any time.

To enter, just submit an entry form by May 31, 2020. You're also encouraged (but not required) to submit photos and short video clips showcasing your project along with your entry form. For more information, please contact Katherine Stanley at sell0146@umn.edu or 612-626-1023. ■

view any area of concern from multiple viewpoints to analyze if repair is required. Overall, the inspection tool has improved safety for inspectors and removes the need for staff to make decisions in the field because the recorded video can be analyzed at any time.

Crow Wing County Highway Department—standardized mailbox support tool

Problem: With more than 60,000 residents and 26,000 homes in the county, the highway department was encountering mailbox supports being set at varying heights. This caused problems when plowing snow; the wing plow could be used to clear snow under some mailbox supports, but not others.

Solution: The county's maintenance specialist made eight identical four-foot boards for measuring the height of mailbox supports. The boards were distributed internally and to mailbox support contractors working on the county's road projects to ensure that all who install or repair these supports are setting them to the same height. Standardizing heights means that fewer supports are hit by plows, ultimately saving the county money in replacement costs and causing fewer disruptions for residents.

Douglas County Public Works—excavator mower attachment

Problem: Public Works staff were unable to reach high overhanging branches and had to borrow equipment to mow cattails and overgrown willows in wet areas.

Solution: County mechanics used an old diamond mower deck to make a quick attachment that can be used on an excavator. The attachment allows staff to mow and clear unwanted vegetation that impedes visibility at intersections and eliminate overhanging branches on county roadways. ■



Standardized mailbox support tool



Excavator mower attachment

Awards honor leadership and service

City of St. Michael Administrator Steve Bot was named the 2019 James F. Miller Leadership Award winner by the League of Minnesota Cities. For the past several years, Bot has served as chair of the I-94 West Corridor Coalition for the expansion of I-94 in an effort to strengthen residential and business communities along the corridor.

At the 2019 National Road Research Alliance (NRRRA) Pavement Workshop on May 23, Benjamin Worel was presented the Gerald Rohrbach Distinguished Service Award. Worel, MnROAD operations engineer, has been with MnDOT for 23 years. His day-to-day activities include research and partnerships such as NRRRA. ■

Technology Exchange

The **Minnesota Local Technical Assistance Program** is part of the Federal Highway Administration's Local Technical Assistance Program (LTAP). LTAP is a nationwide effort designed to foster and improve information exchange among local practitioners and state and national transportation agencies. Minnesota LTAP is administered by the Center for Transportation Studies at the University of Minnesota, and cosponsored by the Minnesota Local Road Research Board and the Minnesota Department of Transportation.

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Technology Exchange welcomes contributions and suggestions from its readers. Submit ideas and other comments to Pamela Snopl, managing editor.

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Toolbox helps local agencies prepare for automated vehicles

Getting highway infrastructure ready for connected and automated vehicles (CAVs, also known as AVs) will require a significant investment in infrastructure upgrades, new technologies, and power and connectivity. As a result, local agencies need to understand not only what the potential benefits of connected vehicle technologies are but also how they should be preparing for the transition to them.

A new toolbox from the Minnesota Local Road Research Board summarizes this information. The main goal of the toolbox is to assist local agencies in preparing for connected and automated vehicles in the short term—5 to 10 years. It provides information so that local agencies can leverage ongoing activities and resources to prepare for CAVs. For example, when restriping, an agency could invest additional resources to ensure pavement markings are compatible with upcoming standards. Other recommendations include:

- **Pavement markings:** Place lane lines after resurfacing, maintain quality lane lines, and, at some point, use 6-inch lane lines. Good-quality lines are one of the most critical needs for the current generation of CAVs.
- **Signing:** Maintain signs in good condition/retroreflectivity and ensure signs are not blocked. Non-standard, blocked, damaged, or faded signing can result in misclassification.
- **Maintenance:** Maintain or implement timely maintenance, particularly when significant surface degradation occurs, such as potholes. It is likely that CAVs will be able to detect maintenance issues (such as faded pavement markings) and report them back to an agency via roadside units.
- **Consistency and standardization:** Review practices to ensure signing and markings are consistent in terms of type of sign used, placement, and application.
- **Data capture and information sharing and inventory:** Develop inventories of features most likely to be impacted by CAVs, such as features relevant to truck platooning (e.g., bridge heights, load restrictions) or safety messaging.
- **Communication infrastructure:** Consider future communication needs in highway plans and communicate with vendors when upgrades are considered. ■

Learn more:

- *Preparing Local Agencies for the Future of Connected and Autonomous Vehicles* (LRRB/MnDOT, 2019-18, May 2019)



An autonomous bus offered rides during a demo held in Minneapolis in April 2018.

MCEA forms CAV committee

The Minnesota County Engineers Association (MCEA) has formed a committee to look at CAV-related topics and issues that have the potential to impact county transportation system design and operation, particularly those that may have potential for enhanced safety. Possible topics include design standards, pavement markings, signing, traffic signals, fleet equipment, data and information sharing, communication infrastructure, and high-resolution mapping.

"Transportation technologies, including CAVs, will continue to evolve, and counties should position themselves to pursue the benefits and prepare for the impacts of these changes," says committee chair Mark Krebsbach, the transportation director/county engineer of Dakota County. "However, the timeframe is likely to be evolutionary rather than revolutionary."

The committee will share information with MCEA members and other partners through conference presentations, regular MCEA meetings, and an annual committee report to the MCEA membership. ■

What driverless vehicles could mean to you

Driverless vehicles raise new questions about how we live, travel, work, and connect. Will we own vehicles or share them? How will we ensure that everyone is served by the new infrastructure? Who will regulate it? And who will pay for it?

Such questions brought together a team of University of Minnesota researchers led by Zhi-Li Zhang, who holds the endowed Qwest Chair in the U's College of Science and Engineering, to search for answers. Under a three-year grant from the National Science Foundation, the team is studying the potential impact of vehicle automation on communities.

Here are some of the ways the researchers believe autonomous vehicles will affect individuals and communities.

You probably won't own a vehicle.

For many people in urban areas, using app-based ride services like Uber or Lyft is easier and more economical than owning a car, finding parking, and paying for gas and insurance. As the world transitions to AVs, researchers believe it's more likely that we'll ride in cars owned by someone else—probably a company like Waymo—and pay per trip or through a subscription service.

The cloud will steer your car.

Proponents of AVs say the technology eliminates congestion by replacing human decisions with a centralized control system that determines the most efficient way to get all vehicles to their destinations. Cars wouldn't have to stop at intersections, and a "smart cloud-based commuter system" (SCCS) would slow or speed each vehicle to prevent crashes.

Flowers might grow in the streets.

Because the technology that controls AVs is so precise, the width of our roads could be reduced. What's more, an SCCS could direct traffic so efficiently that just one (or two, at most) lanes could accommodate a large volume of vehicles. That means more space could be devoted to bike lanes, walking paths, or even gardens.

Parking lots, meters, and garages will vanish.

Roughly a third of all land in urban areas is used for parking and storing cars. Surface lots, street spaces, parking garages, and even your home garage could be repurposed in a world where a fleet of AVs are in constant circulation.

Vehicles will be places for working, sleeping, crafting.

If you don't have to pay attention to traffic on your ride to work, you'll be free to do other things. Happy hour could begin on the way home, in a specially equipped bar car.

Your car will run your errands.

Will AVs make us more productive? Imagine a world where AVs deliver your groceries, drop the kids at soccer practice, and pick up your dry cleaning.

Everyone will be able to hitch a ride.

AVs offer huge potential benefits to the elderly, disabled people, and others who cannot drive. Researchers worry, however, that without proper incentives or regulation, some communities will be left behind. Policymakers will have to ensure that ride providers don't serve only affluent communities. They'll also have to consider the potential impact on rural areas, which may not have enough people to attract ride providers or the funds to build digital and physical infrastructure. ■

(Adapted with permission from the University of Minnesota's Legacy magazine, winter 2019; written by Joel Hoekstra.)



MAINTENANCE

Two simple changes to increase brine usage

Roseville street maintenance worker Josh Dix was slated to present in-person at the Road Salt Symposium last February, but Mother Nature had other ideas.

On the morning of the conference, a heavy, wet snow started falling, and it didn't stop. Dix was kind enough to stop at home in the middle of his plow route so that he could still give his presentation remotely before heading back out into the flurry.

Roseville is trying to use more brine to reduce the impact of road salt on water quality. At the time of the symposium, the city had already used 35,000 gallons of brine during the 2018–2019 winter. Dix credits the increased usage to two easy, inexpensive changes they made to their plow trucks.

No nozzle

Dix says he took a "smart salting" course when he first started working for the City of Roseville and learned that 10 gallons per ton was a good brine rate. He measured Roseville's rates and found they were low. The fan nozzles on the gravity output were allowing only 0.35 gallon per minute.

"It's barely a trickle, so we took the nozzles out," Dix said. "It's really as simple as that."

Removing the nozzle increased brine output up to four times, up to 1.3 gallons per minute. Driving 20 miles per hour with a granular rate set to 400 pounds per mile, the rate was 5.25 gallons per ton with the nozzle. Without it, the rate increased to 19.5 ga/ton. At 30 miles per hour, the rate was 3.5 ga/ton with the nozzle. Without it, 13 ga/ton.

There was some variation with different tank levels, but the increase overall remained significantly higher than with a nozzle. "If you're thinking you're going to lose that coverage, it really wasn't there to begin with. You're not losing much," Dix explained.

Hydraulic pre-wet pumps

December 2013 was very cold, with no sun and a lot of icy hard pack. "We really wanted to get more liquid, especially treated liquid, on our salt to keep

breaking down that hard pack," Dix said. "So that's when we made the decision to start buying trucks with hydraulic control pumps rather than gravity."

Dix likes the hydraulic pre-wet pumps because you can easily calibrate them, just like road salt. They also have speed control to keep your rate even as you drive faster, they allow higher rates so you're able to get more brine out, and you're able to keep accurate records of your brine usage with the pumps. "With gravity, it was a rough estimate at best," Dix said.

He was hesitant at first after hearing bad things—such as seizing pumps—from some people. Roseville has had a few issues, but Dix said they've mainly been due to their own negligence. Pumps need to be cleaned out and prepped for summer properly and kept filled with liquid instead of air at all times. "The one that we took care of has not had any issues," he said.

With the controller, the pump can be set to a max of 72 gallons per ton, and the VariTech Industries pre-wet pump is capable of a maximum of 10 gallons per minute. The flow seemed restricted at higher rates, Dix said, with not much liquid coming out. "Once again, I ended up pulling the nozzles out," he said, in order to get the full flow that the pump is capable of.

Pre-wet vs. DLA

Brine pre-wet is measured using gallons per ton while liquid deicing uses gallons per mile. Because the liquid pre-wet rate is tied to the granular rate, at low granular rates the liquid rates are exceptionally low.

Dix guessed the common direct liquid application (DLA) rates are 50 to 100 gallons per mile. DLA rates are generally higher than anti-icing rates.

If salt is set to 100 pounds and pre-wet to 15 gallons per ton, that converts to 0.75 gallons per mile. If you increase your salt to 200 pounds at the same pre-wet rate, that equals 1.5 gallons per mile. "That's pretty much nothing," Dix explained. "Think about taking a gallon jug of brine and spreading it out over a mile. I can't imagine why that would do very well."

Dix wanted to get to 25 gallons per mile—at the low end for anti-icing, but a good starting point—and to get the pump to max capacity. However, the controller limited the pump to 72 gallons per ton. This didn't require an equipment change, just a programming change.

For around \$100, Force America (of which VariTech is a subsidiary) will email you a file. You put it on a thumb drive and load it into the controller. "It's as simple as that," he said. "You load it and it resets, and now it thinks your pre-wet pump is a direct application pump."

You have to adjust a few calibration settings: disable "pre-wet," enable "direct," and remember your

A modified truck averaged

**34 PERCENT
LESS SALT**

than an average of other comparable routes over eight events.

previous calibration rate. Dix ran out of brine quickly at 25 gallons per mile so he backed it down to 10 gallons, which has been the best balance on a single axle for Roseville. At a granular rate of 200 pounds per mile, this compares to a pre-wet rate of 100 gallons per ton of salt. With cold pavement temperatures, the city has been experimenting with 15 to 20 gallons per mile.

Salt use down

During the 2017–2018 winter, Dix's modified truck averaged 34 percent less salt than an average of other comparable routes over eight events. For three of those events, the modified truck averaged 42 to 68 percent less. During one event, it was over the average by 20 percent.

"That's pretty huge, I think, to be using two-thirds less salt than the average of my coworkers," Dix said. "I'm really excited about the possibility that that gives us in still maintaining a really high service level but using quite a bit less salt to do it."

This past winter they modified a second truck. This driver had previously been one of the higher salt users, but with the modified truck during this past winter's New Year's Eve storm, his salt use was 33 percent less than the average of the other seven trucks, and similar to Dix's modified truck.

There are some challenges. For starters, you run out of brine quickly. Dix wants more liquid capacity, and to be able to drive faster than 20 miles per hour without maxing out the pump.

But with two simple, low-cost changes, Dix and the City of Roseville achieved significant salt reductions. Removing the nozzle increased brine output on their gravity systems nearly 400 percent. In hydraulic systems, he concluded, if you've gone to pumps, reprogram the controller to maximize pump output. "Without any big purchases or an increase in cost, it's possible to use a lot more brine." ■

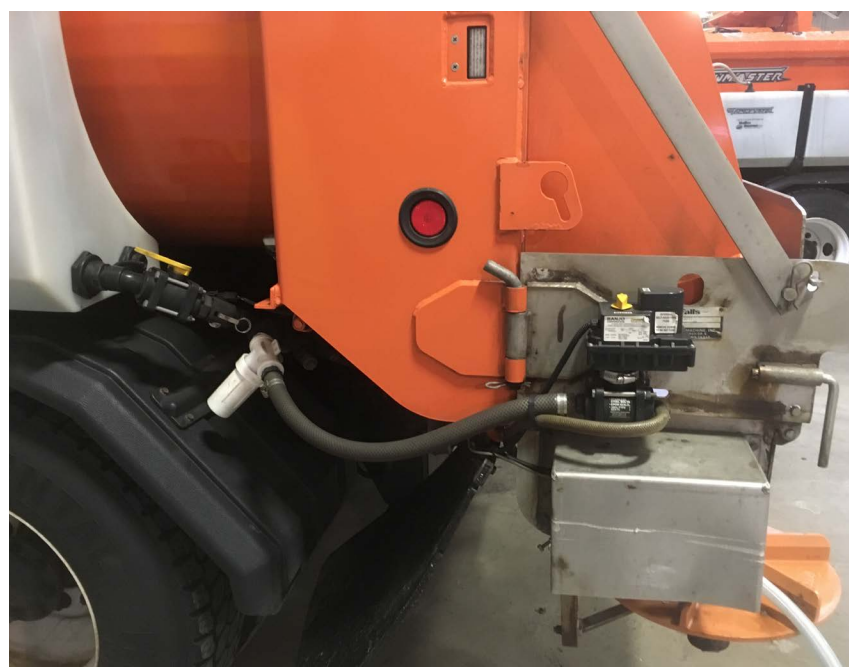
—Paul McDivitt, LTAP freelancer



One simple change:
**REMOVE THE
NOZZLE.**



Roseville's gravity pre-wet system



U of M expert talks about the new hands-free law

On August 1, the hands-free bill passed this spring became law in the state of Minnesota. Nichole Morris, director of the HumanFIRST Lab at the University of Minnesota, describes what it means for a vehicle to be hands-free, what defines distracted driving, and how drivers can drive hands-free.

What does it mean to drive hands-free?

Hands-free is a general term to describe interacting with your phone while driving that does not involve holding or manually interacting with the phone for purposes of dialing, talking, or any other type of input or engagement. Depending on the combination of the driver's phone and vehicle, the hands-free phone use could be through vehicle manufacturer's onboard features, such as microphones, speech recognition software, speakers, and steering wheel buttons, or through aftermarket products, such as headsets or Bluetooth adapters. All of these features may help to reduce, but not completely eliminate, the amount of physical and visual engagement drivers have with their phones while driving.

How does having a hands-free vehicle help decrease distracted driving?

The best way to reduce the risk of phone-related distracted driving is to start any processes (e.g., launching navigation) before you leave, wait until you reach your destination to return messages, pull over to a safe location to use your phone, and employ "do not disturb" functions to block texts from coming in while you drive.

Drivers should always treat the primary task of driving as one that demands all of their mind, eyes, and hands. If you must use your phone while driving, hands-free driving is safer than manually interacting with your phone. This is because tasks that involve taking your eyes and hands away from driving increases crash risk and can have fatal consequences.

Research studies have linked some of the largest crash risks to tasks like texting while driving or reaching in the vehicle while driving. In contrast, tasks like simply talking on the phone (not including dialing) or conversing with passengers are considered less risky tasks while driving. Drivers can use one-button push, hands-free technology to limit the amount of time they may look away from the road at their phones and limit dangerous reaching to grab their phone in the vehicle. Using voice-activated texting, which is allowed under the new hands-free law, frequently requires visual verification and corrections of what had been said to the phone—which is still a dangerous activity that I cannot recommend.

I encourage drivers to go "old school" and talk to their friends and family through Bluetooth or onboard features while driving instead of voice-activated texting.

How can individuals with hands-free vehicles further decrease their distracted habits while driving?

We tend to hear discussions about distracted driving and texting while driving as interchangeable terms, but distracted driving includes a wide variety of behaviors such as eating, grooming, and daydreaming. Although reaching for an object that has fallen to the floor may seem innocuous, it can

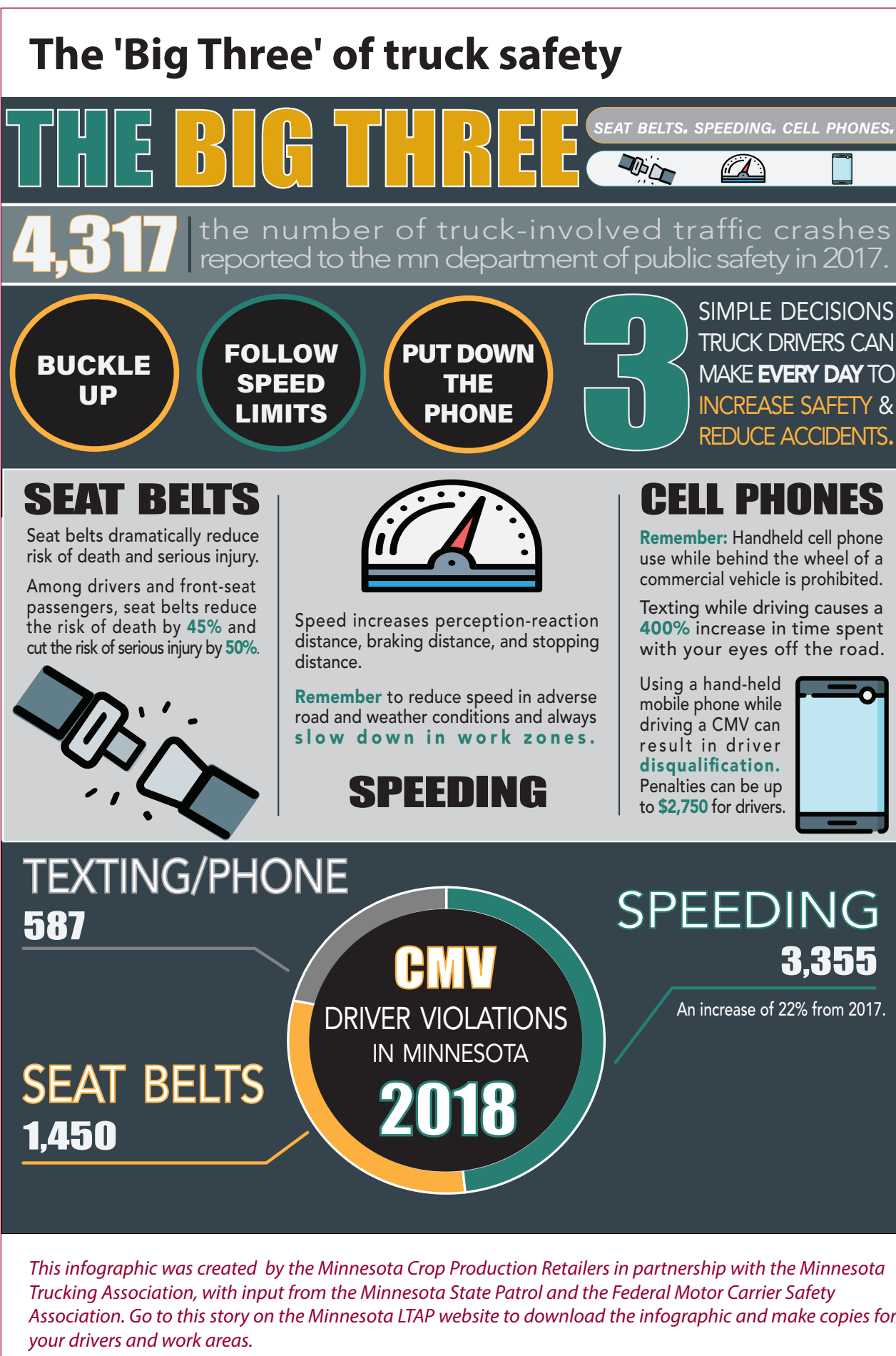
take your eyes and hands away from driving for long enough that you may wind up in a fatal collision or run-off-the-road crash. Pull over to retrieve any objects that you cannot reach without looking or moving your torso.

Passengers can also impose a distraction to drivers. Drivers should firmly let passengers know when they are feeling stressed or overwhelmed with their driving environment and that they need silence to focus. Due to the pronounced risks, I encourage parents to prohibit their teen drivers from having any teen passengers in their vehicle for the first year of independent driving, longer than what is required

by Minnesota's teen driver laws.

Daydreaming or getting lost in thought may be one of the hardest distracted behaviors to control. I encourage drivers to be more engaged in scanning their environment to help keep their mind busy and fully focused on driving. I like to count the number of pedestrians and bicyclists I see in my commute to help be sure I'm always looking for them and quiet the part of my brain that gets antsy for other things to do. ■

(Condensed from a University of Minnesota press release.)



Hands-free educational ideas for your workplace

- Conduct hands-free learning sessions. Review the new law's requirements and any additional company rules.
- Demonstrate how to go hands-free on a variety of cell phone operating systems or vehicle Bluetooth systems.
- Acquire and sell hands-free support accessories (AUX cables, phone holders, earbuds) or offer rebates for employees who demonstrate proof of purchase.
- Incorporate hands-free knowledge into regularly scheduled safety training sessions by offering brown-bag lunch seminars, distracted driving online training, or five-minute safety talks.
- Post informational materials in breakrooms or other common areas.
- More at HandsFreeMN.org ■

WORKFORCE DEVELOPMENT

Drones provide affordable new perspectives for local agencies

Drones have become an affordable option for local agencies looking to save money, save time, and improve the safety, efficiency, and effectiveness of routine bridge inspections as well as a variety of other tasks.

According to FHWA bridge engineer Joe Campbell, good drone systems can now be purchased for \$3,000 or less and operators certified in about a day of preparation, testing, and registration. Commercial drones used by many state DOTs often cost more than \$40,000.

Campbell, who previously worked with



Washington County and MnDOT, introduced public works staff from around Minnesota to affordable drone technology through his presentation and demonstration of drones and peripherals at the eighth annual Minnesota Roadway Maintenance Training and Demo Day, held May 16 at the Olmsted County Fairgrounds in Rochester.

Campbell said drones also have been used for inspecting other structures, pavements, and ditches. In addition, they've been used for public safety, response to a variety of emergencies including floods, project documentation, and cultural resource investigations. Users can also create "orthomosaics" of a series of GPS-tagged photos of sites or geographical features stitched together with specialized software.

"My choice is to walk around and take photos, or I put the drone up in the air," Campbell said. "In a 10-minute flight, I've covered the whole site. I didn't have any chances of getting injured or hurt. For my purposes, I'd much rather use the drone than do it the old-fashioned way."

Drones typically come equipped with a range of options, depending on the model and price. Campbell cited the usefulness of features such as a high-definition camera with an optical zoom for photos and video, GPS, collision avoidance, and infrared vision. In addition, Campbell recommends buying a smart controller with a display (to avoid using a smartphone) and FPV (first-person view) goggles, which offer an immersive live display of the feed from the drone camera as well as review of previously captured photos and video clips.

FPV goggles make it easy to see small items in real-time, undiminished by sunlight. "This is a game changer," Campbell said. "Goggles ensure that you take the images you wanted when you're out in the field."

In 2016, the Federal Aviation Administration introduced Part 107, a new classification for unmanned aerial systems (UAS), or drones, which changed the requirements for operators. Drone use for government or commercial purposes had been restricted to fully licensed airplane pilots, but now operators need only pass a knowledge test without ground school or flight time requirements. In addition, the new rules require that an operator must always keep the drone within sight, fly below 400 feet, and avoid flying directly above traffic or anyone not directly participating in operations. The State of Minnesota also requires drones to be registered.

The change in FAA rules, plus findings from a MnDOT study exploring the use of drones as a tool for bridge inspections, led Campbell to conclude that off-the-shelf drone products can meet the primary needs for routine bridge inspections. He shares the basic steps for starting a drone program through the FHWA's Every Day Counts initiative, which encourages wide implementation of leading-edge technology throughout the transportation industry.

Demo Day attendees also received local road maintenance updates and training refreshers through a series of presentations provided by several other LTAP expert instructors. ■

—Michael McCarthy, LTAP editor

GO TO MNLTA.P.UMN.EDU TO WATCH A VIDEO ABOUT HOW YOUR AGENCY CAN USE DRONES.

High school students dig into transportation construction careers

More than 100 students from five Twin Cities-area high schools got an up-close, hands-on look at transportation construction jobs during MnDOT Construction Career Day on May 15 at the Minnesota State Fairgrounds.

During the daylong event hosted by the Center for Transportation Studies (CTS) on behalf of the MnDOT Office of Civil Rights, students rotated in small groups through nine demonstration stations focused on highway heavy construction. These included planning, design, grading and base materials, iron work, carpentry, maintenance, safety, bridges, and labor.

Each group of students had an opportunity to hold or try on equipment, climb aboard heavy machinery, assemble models, and test their skills in work simulators. A variety of transportation construction professionals—including representatives from several MnDOT offices, contracting and

consulting firms, and trade unions—offered insight, encouragement, and practical advice.

"This has been an extremely valuable event to me personally," said Cole, a Roosevelt High School student interested in carpentry. "Not every kid is going to be able to get out here and see this, and that's honestly, I think, why a lot of kids just don't really get the jobs that they want."

In 2018, 73 percent of Minnesota firms surveyed said they were having a hard time filling salaried and hourly craft positions, according to a survey commissioned by the Associated General Contractors of America. MnDOT especially has been challenged in recent years to replace retiring workers.

"Baby boomers are retiring and we need to develop and train the workforce of the future to step into these positions," said Kim Collins, director of the MnDOT Office of Civil Rights. "The workforce of tomorrow also will be very diverse, so as an industry

we need to foster work environments that are inclusive, where everyone can perform at their best."

Gina Baas added that many of today's youth, especially those with diverse backgrounds, are not aware of the opportunities within the transportation industry. "Events like Construction Career Day help make those vital connections between young people and transportation agencies and contractors," said Baas, the CTS associate director for engagement and education.

Gary Larsen, apprenticeship coordinator for the Laborers Union, attracted the attention of several students at his station with a compelling pitch about the benefits of a career in the trades—good pay, good benefits, and doing something you like right out of high school.

Among the several heavy construction and maintenance vehicles on hand for the event was a fully rigged snowplow with state-of-the-art sensors and controls.

"It's not always obvious that highway heavy construction trades are both innovative and technology focused," Collins said. "We wanted to share a hands-on experience with the students so they could see how we use technology in some areas of our work."

Minnesota LTAP encourages local agencies to reach out to their community students and schools to engage them in what their highway departments and public works agencies do. "We are also exploring how we could become a resource for agencies that want to reach out to the future workforce," says Mindy Carlson, LTAP program manager. ■

(Adapted from CTS Catalyst, July 2019.)



GO TO MNLTA.P.UMN.EDU TO WATCH A VIDEO ABOUT CAREER DAY.

THE SHELF

Minnesota LTAP partners with the MnDOT Library to operate a state-of-the-art service that can help you track down almost any resource from Minnesota or beyond. Questions? Contact Marilee Tuite, Minnesota LTAP librarian, 612-626-8753, ctslib@umn.edu.

Development of Performance Curves for Whitetopping in Minnesota (MnDOT, Apr. 2019)

Develops predictive performance models based on measured performance of existing whitetopping projects in Minnesota.

Disc-Shaped Compact Tension (DCT) Specifications Development for Asphalt Pavement (MnDOT, June 2019)

Refines the disc-shaped compact tension fracture energy testing procedure.

Methodology for Evaluation of Seal-Coated, Gravel, and Dirt Roads (Illinois DOT, June 2019)

Develops methodologies for evaluating different types of seal-coated, gravel, and dirt roads in Illinois.

Construction of New Substructures Beneath Existing Bridges (Iowa DOT, Apr. 2019)

Reviews various methods for constructing a new substructure beneath and within an existing bridge.

Evaluation of Structural Cracking in Concrete: Final Report (Texas DOT, May 2019)

Develops crack-based strength assessment procedures to provide quantitative output related to bridge member health.

Improving the Performance-Graded Asphalt Binder Specification: Final Report (Center for Transportation Research at the University of Texas at Austin, May 2019)

Reviews various new methods that may be alternatives for or used in a complementary manner to the current performance grading specification.

Effectiveness of Innovative Pavement Markings in Facilitating Safe Bicycle Travel (Virginia DOT, March 2019)

Evaluates the effects of two bicycle boxes and two two-stage turn boxes at intersections in Charlottesville, Virginia.

Providing Traffic Control Device Information in a Connected and Automated Vehicle Environment (Virginia DOT, May 2019)

Investigates the development of a digital traffic control device data service that focuses on signs and pavement markings.

Influence of Aggregate Morphology and Grading on the Performance of 9.5-mm Stone Matrix Asphalt Mixtures (Virginia DOT, May 2019)

Investigates the stability of stone matrix asphalt mixtures grading specifications and the effects of aggregate morphology and asphalt binder properties on their stability.

Maintenance-Free Corrosion-Resistant Steel Plate for Bridges (Virginia DOT, June 2019)

Compares the fabrication requirements, corrosion resistance, mechanical properties, construction components, and costs of using traditional bridge steels versus corrosion-resistant steel plates.

Best Practices for Determining Life Cycle Costs of Asphalt Pavements (National Center for Asphalt Technology, May 2019)

Identifies ways of determining inputs for use in life cycle cost analysis procedures to calculate the life cycle costs of pavement alternatives.

Use of Compost for Permanent Vegetation Establishment and Erosion Control (Maryland DOT, May 2019)

Analyzes current standard procedures for final grade turfgrass establishment.

Effects of Temperature Segregation on the Volumetric and Mechanistic Properties of Asphalt Mixtures (Louisiana Department of Transportation and Development, May 2019)

Determines the impact of temperature segregation on the quality of asphalt mixtures. ■

Search me

The Minnesota LTAP website features custom search engines to help you find information. You can search:

- LTAP & TTAP Centers
- State DOTs
- Transit agencies
- University transportation centers

Bookmark mnltpap.umn.edu/publications/library.

Other great resources are:

- LRRB's site: lrrb.org
- MnDOT Library's catalog: dot.state.mn.us/library ■

'What is Public Works?' video targeted to children

The American Public Works Association (APWA) has launched a "What is Public Works?" video targeted to children. The free video helps children understand the value of the public works community. It's on the APWA's YouTube channel. ■

Tailgate Talks: materials for agency training

The Training Resources Workgroup of the National LTAP Association has developed Tailgate Safety



Briefing Packages for agencies to use in periodic safety talks with their crews. Topics include cold-weather precautions and staying fit for snowfighting.

Talks are intended to be short and focused so that, over time and together with existing practices and policies, they help build a culture of safety within local agencies.

The training packages are targeted toward a broad array of public works equipment and practices. Typically, they cover the dangers or risks, some best safety practices, and some statistics. Case studies from OSHA or elsewhere are sometimes included.

The Tailgate Talks web page has instructions for local agencies, tips for giving talks, and links to downloadable materials on more than 25 topics. A link to the page is on Minnesota LTAP's online training page. ■



Plant bee lawns in late fall

Planting bee lawns is one way to help bees and other pollinators survive and thrive. U of M research has shown that adding Dutch white clover, self-heal, and creeping thyme into a lawn will attract many kinds of pollinators, including honeybees, bumble bees, and solitary bees. Planting a bee lawn is best in late fall as a dormant seeding, ideally when soil temperatures dip below 40°F. Learn more at beelab.umn.edu. ■

UAS changing how agencies respond to flooding

The Federal Highway Administration (FHWA) has published a Tech Brief to highlight how unmanned aerial systems (UAS) are being used to respond to flooding events. UAS, or drones, are one of the innovation areas in Every Day Counts round 5.

UAS serve seven mission categories during flood events: strategic situational awareness, survey, and reconnaissance; detailed or structural inspection; ground search and rescue; water search and rescue; debris, flood estimation, and damage assessment;

tactical situational awareness; and material delivery. In the brief, you will learn more about these categories, when each is useful during event response, and primary use cases for UAS. ■

Learn more:

- Every Day Counts: fhwa.dot.gov/innovation/everydaycounts

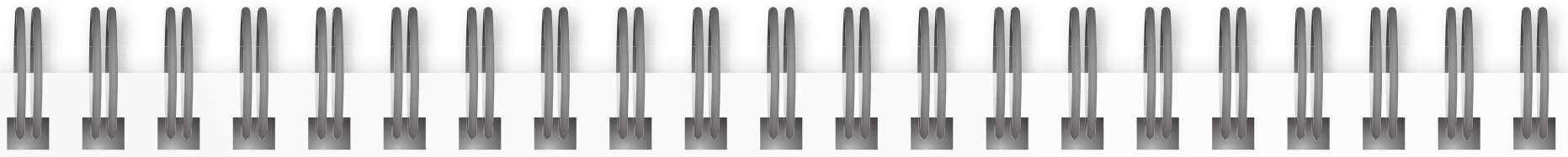


Every Day Counts is the FHWA's initiative to advance a culture

of innovation in the transportation community in partnership with public and private stakeholders.

Answer to test on page 8: Fall is the most important time of year because it allows for increased storage of carbohydrates and encourages root and rhizome production. In the spring, the goal is to give the turf just enough nitrogen to encourage green-up. Some nitrogen in the summer is necessary for the plants to prevent chlorosis (yellowing of the leaf blades).

WORKSHOPS & TRAINING



CALENDAR

For details and an up-to-date list of events, please see mnltp.umn.edu.

Minnesota Truck-Weight Education Training

(1 RS credit) **LTAP**
 Sept. 4, Rochester
 Sept. 11, Duluth
 Sept. 12, St. Cloud

Best Practices: Corridor Management/Maintenance of Paved Recreational Trails

(1 RS credit) **LTAP**
 Sept. 24, Baxter
 Oct. 8, Maple Grove
 Oct. 15, Rochester

Fall Maintenance Expo

(1 RS credit) **LTAP**
 Oct. 2-3, St. Cloud

Statewide Toward Zero Deaths Conference

Oct. 23-24, St. Cloud

Road Salt Symposium

(1 RS credit) **LTAP**
 Oct. 24, Vadnais Heights

CTS Transportation Research Conference

Nov. 7, Minneapolis

Professional Ethics Training

Nov. 19, St. Paul

APWA-MN Fall Conference and Workshop

Nov. 20-22, Brooklyn Center

ONLINE TRAINING: Anytime, anywhere!

Math Basics for Maintenance Technicians
 (1 RS credit)

Installation and Management of Roadside Turfgrasses
 (1 RS credit)

Turfgrass Pathology Course
 (0.5 RS credit)

Culvert Design and Maintenance
 (1 RS credit) **LTAP**

Sign Maintenance and Management for Local Agencies
 (1 RS credit) **LTAP**

Gravel Road Maintenance and Design
 (1 RS credit) **LTAP**

Work-Zone Safety Tutorial
 (0.5 RS credit) **LTAP**

CTAP workshops

Circuit Training and Assistance Program (CTAP) workshops bring LTAP services to your neck of the woods. CTAP uses a fully equipped van to provide on-site technical assistance and training. Each CTAP workshop earns 0.5 RS credit. For more information or to schedule classes, call the CTAP instructor, Kathy Schaefer, at 651-366-3575, or email Kathleen.Schaefer@state.mn.us.



Kathy Schaefer (second from left) leads a CTAP class for on traffic control.

Roads Scholar credit

You can earn credits in Minnesota LTAP's Roads Scholar (RS) program by attending LTAP and CTAP workshops and other cosponsored events. To learn more or enroll in the program, visit mnltp.umn.edu/roadsscholar.

LTAP workshops

LTAP workshops, along with events cosponsored by Minnesota LTAP, are marked with an **LTAP** at left. Check the web for details and to register online: mnltp.umn.edu. To be added to our print or electronic mailing lists, email mnltp@umn.edu or call 612-625-1813.

A CTAP testimonial:

"That was exactly what we were hoping for—a chance to be in the field with a professional on this subject, and to start to see the traffic control subject with a more thoughtful mindset. I think everybody walked away from that [training] feeling better educated and more confident."

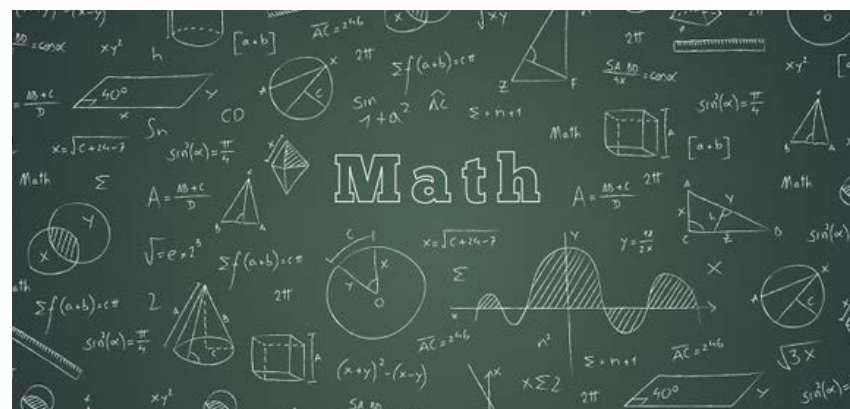
—David Hestad, steam utilities supervisor, U of M Facilities Management

Math basics course now online

Minnesota LTAP has added a new option to its online course offerings: Math Basics for Maintenance Technicians. This free course presents math instruction for maintenance technicians in context. Instead of solving abstract math problems, participants will immerse themselves in typical maintenance technician roles and learn how to approach math problems as they would in the real world.

The self-paced training is offered via the TC3 course management system. TC3 is a technical service program within AASHTO that focuses on developing training products for technical staff in the areas of construction, maintenance, and materials. Students will earn 1.0 Roads Scholar credit.

This course is part of the TC3 Math Basics for Highway Technicians series, which offers options ranging from basic arithmetic calculations to using complex formulas. ■



Turfgrass: when should you fertilize?

When is the most important time to apply fertilizer to cool-season turfgrass?



See answer on p. 7.

To learn more about turfgrass fertilization, consider taking the U of M's online course: Installation and Management of Roadside Turfgrasses. ■



Attend a course on professional ethics

On November 19, the Center for Transportation Studies is offering a course that will explore ethical dilemmas commonly encountered by engineers and planners—and their appropriate solutions. The two-hour course will be held from 8:00 a.m. to 10:00 a.m. on the U of M's St. Paul campus. The course meets the ethics-related requirements for engineers (2.0 PDHs) and planners (1.5 AICP Certification Maintenance credits) to renew their credentials in Minnesota. For more information, visit cts.umn.edu/events/ethics. ■