Regional DOT’s and Federal Highway have been interested in Accelerated Bridge Construction techniques to address bridge rehabilitation and replacement in locations where long shut downs are not possible. These projects typically involve the use of modular, prefabricated bridge components. However, most designs require cast-in-place concrete joints between the prefabricated sections. These joints are labor intensive to install and are vulnerable to cracking and deterioration over the life of the bridge.

Under the guidance of UNH Professor (and T2 Center’s Executive Director) Charlie Goodspeed, UNH spent several years developing an alternative concept to eliminate these cast-in-place joints on a prefabricated bridge deck. The UNH concept uses precast concrete panels that span the full width of a bridge deck and are shaped to match the crown and cross-slopes of the roadway. The panels are supported by “leveling screws” over each bridge girder that allow adjustment of the panel’s height and pitch as well as the amount of weight bearing on each girder. These leveling screws extend through the top of the deck panel and allow the attachment of eye bolts for lifting the panel with a crane. The panels fit together with tongue-in-groove joints held closed with post-tensioning bars and sealed with a custom high strength polymer applied as each panel is joined. Testing on this joint system was completed by several UNH graduate students and showed that this joint system was superior in strength to the concrete panel.

Panels staged prior to erection.
With the not so lazy days of summer at an end, it’s only fitting to recognize that you were all breaking a sweat in this summer’s record heat. While the rest of the world was erecting tents you were erecting signs and bridges. Instead of casting lines you were painting them. They were riding waves while you were riding heavy equipment. When others were hitting the trails, you were all hitting the projects hard and fast.

Thank you for all your hard work keeping us on the move and on the road safely and smoothly.

As we look to the next 3 months with 2016 coming to a close, so does LTAP/T2 Center’s 30th anniversary. We are asking for your T2 Center and workshop memories. Wouldn’t it be grand to see your anecdotal thoughts or fun pictures about your experiences with T2 over the years in lights? Well maybe not lights but definitely in a newsletter centerfold spread. We are 30 years strong and growing because of, and FOR, you.

Send your messages and photos to me at the Center at stephanie.cottrell@unh.edu.

Sometimes a short walk down Memory Lane is all it takes to appreciate where you are today.

Susan Gale

Stephanie Cottrell
NH LTAP Training Coordinator
Technology Transfer Center
Gilford Bridge

NHDOT partnered with UNH to demonstrate the use of this precast deck system. The bridge selected for the demonstration was the Route 3 Bypass over Route 11A in Gilford, NH which is a single span bridge of approximately seventy feet with a roadway width of fifty feet.

The bridge is skewed at an angle of twenty-two degrees which further complicated the geometry of the deck panels. The final design required nine panels each with a length on the skew of sixty feet, a width of eight feet to allow trucking on a standard trailer, and a depth of nine inches. The panels were pre-stressed transverse to the roadway and were to be post-tensioned longitudinally with the roadway to put the deck in uniform permanent compression and keep any cracks that may form closed, producing a deck superior to a traditional cast-in-place deck.

Each panel included fourteen leveling screws providing two points of contact over each of the bridge’s seven steel girders. This also provided fourteen lifting points, as previously described, to reduce the stresses on each panel during handling. Three pockets over each girder were provided in the panels to allow the installation of shear studs after panel placement and final grouting of the shear connectors and haunch space above each girder, completing a fully composite, monolithic deck.

UNH faculty and graduate students worked with NHDOT engineers to design the deck panels and develop a software program to calculate the length of each leveling screw to produce the final required roadway grade and evenly distribute the dead load of each panel to the girders by checking the torque on each screw after placement. A frame system was also developed by a UNH graduate student to allow the long, thin panels to be hauled by a truck from the precast yard to the site without damage due to dynamic forces. Finally, UNH also proposed a novel traffic detour system that converted the four-ramp interchange around the bridge into a traffic circle with the installation of a few paved segments between the ramps and the Route 3 Bypass roadway.

Concrete remaining over each girder between the existing shear studs was hand chipped and the shear studs were torch-cut flush with the top flange. At the locations where each new panel leveling screw was expected to bear, the flanges were ground smooth. Meanwhile, the contractor’s engineer pre-set the leveling screw lengths on the staged panels using the UNH software and assisted by UNH graduate students.

The first panel was set roughly twenty-four hours after the road closure. As each panel was set, post-tensioning bars were installed in ducts through the core of the panel and joined to bars in the previously set panel. The high strength polymer was then mixed which started a ten minute period in which polymer was required to be applied to the mating faces of each panel and the panels joined before the polymer began to set. As soon as the panels touched, the post tensioning bars were tightened to a fraction of the final post-tensioning load to squeeze the liquid polymer out of the joint and fill in any imperfections in the concrete mating surfaces. Within one hour, the polymer gained sufficient strength to allow full post-tensioning force to be applied across the now-solid joint. Once fully post-tensioned, the next panel could be placed.

Due to the angle of the deck skew, it was noticed that the panels tended to slide laterally when initially post-tensioned, reducing the squeezing and distribution of the polymer. Chain-jacks were used to fight this sliding action, which improved panel contact, but did not fully resist the panel displacement. As panel installation continued, it was noticed that completed joints continued to slide due to elastic deformation of the polymer when fully post-tensioned. Several joints eventually failed during construction with the panel slip effectively relieving the post-tensioning force. It was decided by NHDOT engineers to abandon final post-tensioning and rely on the composite action provided by the shear connectors and grouted haunches to complete the deck.

The panel grades, as set by the UNH software, turned out to be extremely accurate. As the last panel was set, it was noted that the grade of the panel matched the existing roadway surface within a few fractions of an inch. The method of pre-setting the leveling screws allowed this accuracy to be achieved with minimal time expended in the field. Torque checks were completed in a matter of minutes and minor grade adjustments could be made rapidly.
What do hydraulic modeling tools, ultra-high performance concrete, and data-driven safety analysis have in common? Each is among the innovations selected for deployment under the Every Day Counts (EDC) initiative. EDC is the innovation partnership between the Federal Highway Administration and the American Association of State Highway and Transportation Officials, launched in 2009 to take on the challenges presented by limited budgets and to speed up the delivery of needed highway projects.

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EdC-4, the fourth round of EDC innovations, is focused on fostering a culture of innovation to encourage collaboration, maximize efficiency, and improve environmental sustainability in transportation networks. The innovations selected for deployment under EDC-4 were chosen for their ability to encourage collaboration, maximize efficiency, shorten project delivery, enhance safety and durability, and improve environmental sustainability in transportation networks.

This fall, FHWA will host seven EDC Innovation Summits across the United States and provide support for up to 12 individuals from each State to participate. During the summits, participants will hear success stories related to the State Transportation Innovation Council network and learn about the 11 new innovations. During and after the summits, States will identify which innovations they are interested in pursuing for adoption, and deployment teams organized by FHWA will provide training and technical assistance to facilitate each State’s adoption of their chosen innovations. States also can leverage incentives up to $100,000 per year to pursue adoption of EDC innovations from all rounds, as well as other innovations. States and other entities eligible for Federal aid can pursue grant funding under FHWA’s Accelerated Innovation Deployment Demonstration program as well.

“EDC continues to foster a culture of innovation,” says Federal Highway Administrator Gregory G. Nadeau. “And that culture is really beginning to take root nationwide.”

Without further ado, here are the innovations recently unveiled for deployment in EDC-4.

Continue to page 5
Hot Topic

Accelerating Traffic Incident Management (TIM) Data Collection
A TIM program is the systematic, planned, and coordinated use of human, institutional, mechanical, and other resources to shorten the duration and impact of incidents on U.S. roadways, and improve the safety of motorists, crash victims, and incident responders. This innovation focuses on improving the adoption and consistency of the collection of TIM data and increasing the volume of data from transportation, law enforcement, and other responder agencies. Further, this innovation promotes the use of low-cost, off-the-shelf technologies that streamline data collection, so agencies can measure and improve the performance of their programs.

Advanced Hydraulic Modeling Tools
Current modeling techniques used for hydraulic design apply several assumptions that can lead to overly conservative or inaccurate results. Advanced hydraulic modeling technologies offer planners, scientists, and engineers tools to depict specific physical, environmental, and habitat characteristics more accurately through 3-D visualization of flow, velocity, and depth.

Automated Traffic Signal Performance Measures
Highway agencies typically rely on complaints or manual data collection to identify the need for signal retiming projects and their outcomes. These projects are typically scheduled on a 3- to 5-year cycle, at a cost of approximately $4,500 per intersection. The costs and effort associated with collecting performance data translates into congestion, reduced safety, and increased delays for vehicles, pedestrians, and bicyclists.

That’s where automated traffic signal performance measures come in. They will revolutionize the management of traffic signals by providing the high-resolution data needed to actively manage performance. High-quality service can be delivered to customers with significant cost savings to agency maintenance and operations. A number of implementation options are available, ranging from a low-cost, open-source code framework to a fully integrated traffic signal system.

Community Connections
Many cities have highways that have reached, or exceeded, their useful lives. The timing is ripe to hold forums for transportation professionals to discuss and consider high-way retrofitting, rehabilitation, or removal options to improve connections between urban cores and neighboring communities. This innovation underscores the value of transportation in community revitalization, such as improving connectivity between disadvantaged populations and essential services.

Data-Driven Safety Analysis
Data-driven safety analysis is the use of cutting-edge software to analyze crash and roadway data and determine the expected safety performance of roadway projects more reliably. This type of analysis enables agencies to predict the safety implications of their decisions with confidence. Engineers now can quantify the safety impacts when making investment decisions, just as they do with environmental, traffic, and other traditional impacts. The analyses result in more scientifically sound, data-driven approaches to committing resources, as well as fewer and less severe crashes on the Nation’s roadways.

e-Construction and Partnering: A Vision for the Future
State DOTs have traditionally administered contracts and managed construction of highway projects using extensive, paper-based documentation systems. By using digital e-Construction technologies, DOTs can enhance partnering among stakeholders on project teams, while improving communications and workflow to streamline the delivery of projects.

Through e-Construction technology, project personnel can access plans, records, State specifications, and more in real-time using mobile devices.

Integrating the National Environmental Policy Act (NEPA) and Permitting
Integrating the NEPA and permitting processes seeks to transform how agencies and stakeholders conduct
10 Tips for Winterizing Your Fleet

As the temperatures begin to fall, there’s no better time to perform a winter maintenance check on your vehicles and outdoor engines. Here are 10 tips to help you make sure that your fleet is ready for even the worst winter weather.

1. Gas
Keep your gas tank at least half full. Water vapor can collect in the bottom of your tank and when drawn into your engine’s fuel line, it can freeze in the winter and prevent your engine from starting. Adding a bottle of gas-line antifreeze such as HEET® or Iso-HEET® to your gas tank combines with the water and enables it to be burned.

2. Oil
As the temperature drops, it’s important to make sure you are using the right viscosity of motor oil. In especially cold climates, even oil with a viscosity of 10W-30 may be too thick! It’s best to check your owner’s manual for the recommended viscosity for freezing temperatures.

3. Belts
Just as heat and everyday driving can cause wear and tear on your vehicle’s belts, so can cold weather. A worn timing or v-belt could spell disaster for you and your vehicle, especially when driving in remote regions. Make a belt inspection part of your regular routine and check for signs of fraying or cracking. Change any worn belts now to help avoid a breakdown during the worst of winter.

4. Fluids
The best time to check and top off your vehicle’s fluids is before harsh winter weather hits. Check and top off engine coolants, power steering, brake, windshield washer and battery fluids.

5. Spark plugs
If your engine gets off to a rough, jittery start, misfires or simply doesn’t want to start, there’s a good chance it could be the spark plugs. The side of the road is certainly no place to be in a winter storm. So check your spark plugs, making sure to clean or replace them if necessary.

6. Battery
Summer heat takes its toll on batteries. However, in the winter cold, when you need the extra cranking power, your battery may not be up to the task. Consider replacing it if it is more than 3 years old and keep the contacts free of corrosion with a battery post and terminal cleaner.

7. Wipers
Inspect wiper blades for fraying or cracking and consider using heavy-duty winter blades for tough ice buildup.

8. Tires
If your vehicles operate in a cold region with snow and ice, all weather tires may not offer the best performance. Consider outfitting your fleet with winter tires instead. They offer better traction in icy conditions and even cold, dry roads.

9. Lights
In the darker winter months, it’s important to be seen by other drivers. Walk around your vehicle to make sure all lights are working.

10. Brake Pads and Shoes
With slippery winter road conditions, making sure that your brakes are in working order is a top priority. If your brakes make a high-pitched squealing sound when engaged, it’s time change them out for a new pair.

Other engine maintenance
It’s important to also keep other equipment running through the winter season. Snow throwers, generators and other two- and four-cycle engines may not be used for long periods of time. As a result, the fuel may form gum and varnish deposits.

In less than 60 days, these deposits can clog fuel lines, injectors and fuel filters. The results are startup problems, sluggish performance and even reduced engine life. By adding a gasoline stabilizer such as STA-BIL®, the fuel will remain fresh for up to 12 months and helps prevent gum and varnish build-up during months of storage. STA-BIL® also prevents corrosion and rust caused by accumulated condensation in the fuel system.
concurrent, synchronized environmental and permitting reviews, saving time and cost for the agencies involved.

**Pavement Preservation (When, Where, and How)**

Applying a pavement preservation treatment at the right time (when), on the right project (where), and with quality materials and construction (how) is a critical investment strategy to help meet performance expectations. This innovation helps deploy an array of different analyses, treatments, and construction methods to help infrastructure owners achieve and sustain a desired state of good road repair despite tight budgets.

**Road Weather Management – Weather-Savvy Roads**

Weather events lead to traffic delays, reduced operational effectiveness, and increases in crashes. This innovation deploys two distinct road weather management solutions: (1) Pathfinder, which brings together DOTs and the National Weather Service to provide consistent messaging on adverse weather and road conditions, and (2) advanced vehicle-based technologies, also referred to as integrated mobile observations. These two solutions have the potential to be transformative, enabling State and local agencies to be proactive when it comes to weather, so they can manage the road system ahead of heavy rain, snow, or other storms.

**Safe Transportation for Every Pedestrian (STEP)**

Pedestrians account for an estimated 15 percent of all roadway fatalities, the majority of which are at uncontrolled crossing locations (such as midblock crossings) or at intersections with no traffic signal or STOP sign. This innovation helps transportation agencies address such
crashes by promoting cost-effective countermeasures with known safety benefits.

Ultra-High Performance Concrete Connections for PBES

Prefabricated bridge elements and systems (PBES) offer superior durability and speed the onsite construction of bridges. The durability of prefabricated spans and how quickly they can be constructed is dependent on the connections between the elements. Ultra-high performance concrete can be used to help provide simple, strong, and durable connections for prefabricated bridge elements.

These workers are installing ultra-high performance concrete as a durable connection between prefabricated bridge elements on a bridge carrying U.S. 6 over Keg Creek near Council Bluffs, IA.

“The innovations in this round will build on the impressive records of the previous rounds,” Nadeau says. “This is the first round since the State Transportation Innovation Council network was completed and, naturally, we look forward to great things.”

For more information, visit www.fhwa.dot.gov/innovation/everydaycounts/edc_4. See also “Building a Culture of Innovation” on page 4 in this issue of Public Roads.

Thomas Harman is director of FHWA’s Center for Accelerating Innovation, which administers EDC and leads the development and coordination of additional strategic programs to deploy innovations.

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This year in History


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Gilford Bridge

After panel placement and grouting of the shear stud pockets and haunches, the roadway was reopened to traffic. Bridge rail and deck edge coping were cast in place behind jersey barriers without impeding traffic flow. A brief road closure following this work allowed the bare concrete deck to be paved completing a seamless driving surface with the approach roads.

This project demonstrated the success of numerous UNH innovations. The full-width deck panels, which included the roadway skew, showed that a thin concrete panel with a crown could be successfully prestressed, transported with a UNH-designed frame, and erected without producing cracking in the panels. The software developed by UNH to compute the leveling screw lengths allowed accurate panel placement with minimal time and field adjustment. Finally, the traffic management concept of turning a conventional interchange into a traffic circle performed well and allowed adjustment of the closure period without significant impacts to the traveling public.

UNH continues to evaluate the lessons learned on this project with NHDOT engineers to advance the state-of-the-art of Accelerated Bridge Construction, keeping NH in the forefront of this important field of infrastructure maintenance and management.

James Browne is a Research Engineer at the University of New Hampshire.
The Roads Scholar Program establishes educational and training requirements for municipal level highway practitioners, and recognizes those who have successfully completed specified T2 Center workshops. Annually, the T2 Center publishes a directory to acknowledge those who have earned an achievement level among our Roads Scholars.

Since January 1, 2015, there are six levels in the NH Roads Scholar Program, plus an additional “side award.” Each Level has a defined number of contact hours, and Level 2 requires attendance at workshops in specific subject areas. A contact hour is an hour of actual instruction. A typical one day workshop includes 5 hours of instruction and a specific subject area to ensure that training covers a range of subjects essential to local road management. In addition, if Roads Scholar participants earn 20 contact hours in the Safety category, they earn a Safety Champion award.

### § Roads Scholar 1
- Requires 25 contact hours
- Tyler Atwood  Town of Raymond
- Scott Bailey,  Town of Lyme
- Christopher Boucher  Town of Raymond
- Arthur Gelsi  NHDOT District 2
- Jeff Hastings  Town of Grantham
- Dale Havunen  Town of Henniker
- Chad Hayes  NHDOT District 3
- David Heath  Town of Canterbury
- Wade Heath  Town of Conway
- Brandon James  Town of Wakefield
- Anthony Linkkila  Town of Wolfeboro
- Robert Maloney  Town of Alexandria
- Tom Moore  Town of Henniker
- Troy Power  Town of Alexandria
- William Rollins  NHDOT District 3
- Daniel Rondeau  Town of Alexandria
- Paul Sirard  Town of Atkinson
- Adam Stasio  Town of Bristol
- Joe Walenda  Town of Tilton
- Fred Wells

### § Roads Scholar 2
- Requires 50 contact hours in specific subject areas: 5 hours of Environmental, 10 hours of Safety, 5 hours of Supervisory, 20 hours of Technical, 10 additional hours
- Kevin Hodgdon  Town of Bedford
- Mark Lavoie  NHDOT District 1
- Todd Murray  City of Claremont
- Steven M. Williams  Town of Lyme

### § Senior Roads Scholar
- Requires 75 contact hours
- Scott Hazelton  Town of Sunapee
- Chad Jaquith  City of Concord
- Leigh Nichols  Town of Wakefield
- Larry Young  Town of Tilton

### § Master Roads Scholar
- Requires 100 contact hours
- S. Michael Gingras  Town of New Durham
- Noel Gourley  Town of Bow
- Kenneth Hamilton  City of Claremont
- Carl Peare  Town of Conway
- Jason Rucker  Town of Exeter
- Tom Weston  Town of Henniker

### § Master Roads Scholar 2
- Requires 150 contact hours and individual must be a Safety Champion
- Michael Faller  Town of Meredith
- Scott Johnston  Town of Enfield
- Charles Perkins  Town of Stratham

### § Safety Champions
- Requires 20 Safety contact hours
- Joseph Boucher  City of Dover
- Robert W. Donnelly, Jr.  Town of Enfield
- Timothy Fiske  Town of Temple
- Dean Truax  City of Dover
- Keith Weed  Town of Charlestown
- Neal Beauregard  Town of Greenfield
- Joseph Boucher  City of Dover
- Kevin Coakley  City of Dover
- James Dicey  Town of Troy
- Robert Donnelly, Jr.  Town of Enfield
- Timothy Fiske  Town of Temple
- Aaron Fleury  Town of Sanbornton
- Dennis Ford  NHDOT District 2
- Brian Grinavic  Town of Meredith
- Fred Hawkins  Town of Meredith
- Damian Hetzel  Town of Enfield
- Craig Hoffman  Town of Pelham
- Jim Hoffman  Town of Pelham
- Leon Holmes  Town of Fremont
- Dean Hooper  City of Claremont
- Brian Houghton  Town of Deering
- Mike Kos  Town of Goffstown
- Jim Major  City of Concord
### Roads Scholar cont.

#### Safety Champions Requires 20 Safety contact hours

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### NH Construction Career Days 2016

Over 1200 hard hats were assembled during the 2016 Municipal Plow Rally in preparation for NH Construction Career Days.

#### municipal Plow Rally 2016 Winners

**Plow Rally:**
- 1st: Town of Walpole
  - Ken Silva, Ken Tompson
- 2nd: Nashua Eric Johnson, Robert Lajoie
- 3rd: Dover Jamie Stevens, Todd Cormier

**Backhoe:**
- 1st: Fulton Mountain, City of Dover
- 2nd: Steve Towle, Town of Exeter

### This year in History

November 25, 1986, a press conference during which Ronald Reagan and his attorney general, Edwin Meese, informed the American public that they had discovered a “diversion” of funds from the sale of arms to Iran to fund the contra war.
Be the first to complete this word search and send it to T² any of the following ways to win a FREE T² workshop!

Fax: 603-862-0620
Email: stephanie.cottrell@unh.edu
Mail: Technology Transfer Center
33 Academic Way
Durham, NH 03824

Words can be circled either upward, downward, backward, or diagonally.
Have fun!

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**Word Search**

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Forecasting
Heavy Equipment
Chip Seal
Slurry System
Sliplining
Reinforcement
Tag Out
Lock Out
Trench Safety
TIM Training
Shoring
Innovation
Data Collection
Polymer
The T2 Center is working to update your resources web page.

If you have any suggestions on applicable resources or items you would like to see included, please contact us at t2.center@unh.edu

OR

603-862-2826

(Links, book titles, videos, articles, documents, etc)