

# Technology Today

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## Upcoming Events

**NHI Course No. 138004 - MAP 21 Transportation Performance Management Overview (Including FAST Act Updates)**

November 16  
TTEC 100 and 175

**NHI Course No. 151056 - Highway Performance Monitoring System (HPMS): Concepts, Data Collection and Reporting Requirements**

November 29-30  
TTEC 175

To view more events, please visit  
<http://www.ltrc.lsu.edu>.

## Local Students Gain Attention for Glow-in-the-Dark Concrete Research

Worldwide, an average of 3,287 people die every day due to car accidents. Over 40% of these accidents occur at night. However, local students from St. Joseph's Academy believe they have come up with an environmentally friendly and creative solution to improve these statistics: glow-in-the-dark concrete.

SJA Senior Meredith Guidry and LSU freshman and SJA graduate Aniko Nowakowski recently won local and international awards for the work they conducted on their project, "Glow-in-the-Dark Concrete: Assessing the Effectiveness of Different Surface Treatments Incorporating Strontium Aluminate in regards to Visible Luminescence Emission and Resistance to Abrasion." Their project explored ways to create a bright luminescent coating that could be painted onto a road's exposed surface, while also maintaining the road's integrity and strength against abrasion.



With the help of LTRC Associate Director of Research Tyson Rupnow, Ph.D., P.E., LTRC Concrete Research Engineer Amar Raghavendra, P.E., and LTRC Engineer Intern 2 Zachary Collier, E.I., Guidry and Nowakowski were able to test various samples utilizing strontium aluminate (the glow-in-the-dark material) at LTRC's concrete lab. New Zealand-based company GloTech International donated the strontium aluminate crystals, and local manufacturers donated gallons of curing compound and sealant for testing.

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# Researchers Reveal High Performance of Internally Cured Concrete

Proper curing is the key to durable and sustainable concrete structures. When a concrete mixture is designed, delivered, placed, and consolidated, curing is the final and most critical part for a quality final product. Insufficiently cured concrete can lead to cracking, causing eventual failure in concrete structures; however, proper curing is difficult to both monitor and enforce. Because of this, researchers at LTRC evaluated a new concrete mixture with a self-curing capability with the goal of reducing the length of curing time and achieving sustainability in structures by minimizing or possibly eliminating cracks. Researchers believe the implementation of internal curing technology will provide a benefit to the Department in terms of longer service-life structures with a lower life-cycle cost.

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Through their project, “Evaluation of Portland Cement Concrete with Internal Curing Capabilities,” Associate Director of Research Tyson Rupnow, Ph.D., P.E.; Research Engineer Amar Raghavendra, P.E.; Engineer Intern 2 Zachary Collier, E.I.; and DOTD Special Materials Testing Engineer Patrick Icenogle, P.E., explored the use of concrete mixes with differing percentages of lightweight aggregate sand for internal curing benefits as well as additional methods for determining available moisture on saturated lightweight aggregate sands. Samples were produced in laboratory conditions at two water-to-cement (w/c) ratios and then tested along with two field trial placements for bridge deck concrete: one in North Louisiana on the U.S. 80 Bridge over the KCS railroad near Ada and the other on the West Congress Bridge in Lafayette, LA. Each was a newly constructed bridge with portions of the structure incorporating internally cured concrete (ICC).



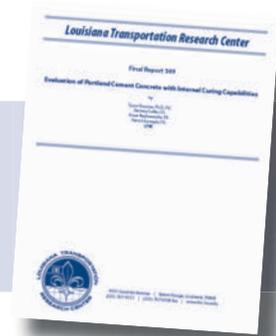
*150 pcy ICC placement (note the lack of curing compound on the right)*

The field trials revealed that ICC performs comparable to conventional concrete in terms of application and performance. In both field test locations, the contractor aiding in the installation of the new bridges noted easier finishability characteristics and added, “ICC is just like normal concrete.” As far as performance goes, the West Congress project indicated reduced cracking at one year over the control sections, and the Ada project showed significantly less cracking over the control about nine months after placement of the ICC sections.

“The results show that lightweight aggregate sands, when used for internal curing purposes, do not adversely affect the fresh or hardened concrete properties,” explained Dr. Rupnow. “Hardened properties of strength and surface resistivity are generally improved. The cracking potential has been shown to be reduced through the two document field applications, even where the curing compound was inadvertently not applied.”

Based upon the laboratory and field results, researchers suggest that a standard lightweight fine aggregate replacement rate between 225 and 275 pcy (pounds per cubic yard) be implemented. A wet cure of 7 days is also recommended. Dr. Rupnow added, "The section placed without a curing compound has yet to crack for the 150 pcy ICC mixture placement, and this is the worst case scenario. The reduced cracking will lead to longer service life and a more durable structure."

According to Dr. Rupnow, there is still further research to be completed; however, depending on successful results, researchers believe a TR procedure should be developed for the test method, and training materials for the test method would include a half-day course with hands-on training and an instructional video.



### FIND OUT MORE

For more information about this project or to read the report in its entirety, please visit <http://www.ltrc.lsu.edu/publications.html> and select Final Report and Technical Summary 569 under Concrete.

## Save the Date for LTRC's 30th Anniversary Celebration

New and old friends of LTRC are invited to our 30th Anniversary Celebration this spring. **Mark your calendars for March 8, 2017!**

Over the last 30 years, the center has grown tremendously in size, capability, and experience. This celebration will serve as an opportunity for the public to view some of LTRC's latest advancements and capabilities up close with a tour of the center's labs as well as both LTRC and TTEC buildings. Guests will also learn more about current LTRC research, its value in our economy and infrastructure, as well as the local and nationwide impact contributed by LTRC during technical presentations given by a variety transportation and research professionals.



In addition, guests will have the opportunity to hear from DOTD Secretary Dr. Shawn Wilson and Chief Engineer Janice Williams as well as many other invited distinguished guests and speakers.

# LTAP Offers New Class on Road Safety

LTAP's latest safety class, Road Safety 365, is a new workshop that focuses on incorporating safety into all aspects of local and rural road management activities, and on making safety a priority through inclusion in the traditional decision-making process 365 days a year. The new course is taught by safety expert and LTAP Program Manager Steven C. Strength, P.E., PTOE, who currently serves as the co-chair of the Louisiana Strategic Highway Safety Plan (SHSP) Infrastructure and Operations Statewide Implementation Team and is the Senior Technical Advisor for the Local Road Safety Program.

The course illustrates how safety can be integrated into rural/local transportation project development at all stages, including planning, programming, design, construction, operations, and maintenance, and offers an overview of the network screening process using available local crash data.

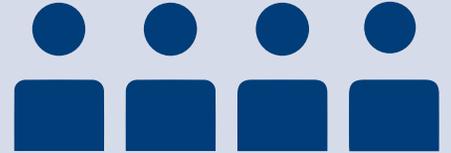
Strength explained, "Emphasis is placed on providing easy-to-use tools and practices so that all employees can be 'the extra set of eyes' to 'read the road' and identify potential hazards to safety that are often overlooked. Improved safety can often be accomplished through implementing extremely low cost and timely measures as part of everyday maintenance and operations activities. Practical exercises and discussions place an emphasis on safety being everyone's job, 365 days of the year."

LTAP Training Program Coordinator Courtney Dupre added, "This class is part of the LTAP's contribution to the implementation of the Louisiana Strategic Highway Safety Plan and the Local Road Safety Program. Louisiana has a goal of eliminating traffic-related deaths and serious injuries, and it will take each and every one of us to do our part personally and as part of our transportation-related professions."

As a 31-year DOTD veteran, Strength's vast experience in the field and commitment to assisting local agencies improve road safety and save lives create a great learning experience for participants. "This combination helped make this class into a workshop showcasing practical and effective ways for local and rural agencies to incorporate safety solutions in their daily activities and in project development," explained Dupre.

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## Participants in this training can expect to:



- 1 Pay more attention to possible road safety hazards and signage
- 2 Take more site visits to have a better read on the roadway
- 3 Encourage the crews to report issues even if it is not in their line of work
- 4 Share information
- 5 Train other employees
- 6 Learn to look and define problem areas and solutions to fix them
- 7 Evaluate and implement low-cost countermeasures
- 8 Look into resource handouts of coalition
- 9 Think safety first—it is everyone's responsibility to report all hazards
- 10 Build a safety culture
- 11 Renew maintenance routine to incorporate safety measures and look at crash data for opportunities to use simple countermeasures

## Glow-in-the-Dark Concrete Research

cont. from pg. 1

“We helped the SJA students with the mixture preparation and testing of photo luminescent concrete coatings (containing strontium aluminate) for use as a building material,” explained Raghavendra. “We also assisted with the red, green, blue (RGB) color measurements to quantify luminescence, abrasion tests, and statistical analysis.”

Through numerous tests in the lab and examinations of pixels from the photos taken of the samples in the dark, Guidry and Nowakowski discovered that the sealant application sample was a clear winner. It produced a low average mass loss during the abrasion test and emitted a relatively high luminosity.

“We enjoyed learning about strontium aluminate as a material and all its possibilities as a surface treatment,” explained Nowakowski. “Some people may think that concrete is just some boring material that we use to construct our world, but when you actually look into the multifaceted uses of the material, the possibilities are endless! We chose to research concrete because concrete is such a global material. It has a hand in essentially all of the world’s construction. It is something that applies to and affects every single person, so we thought it would definitely be worthwhile to explore ways to make this global material even more effective. We see big things for glow-in-the-dark concrete in the future!”

Guidry and Nowakowski also face bright futures as their hard work paid off in the highest form.

After winning 1st place in the Mechanical Engineering category at the Louisiana State Region VII Science and Engineering Fair, Guidry and Nowakowski secured one of the few spots offered to Louisiana students to present at this year’s International Sustainable World Energy, Engineering & Environment Project Olympiad (I-SWEEEP), held at the George R. Brown Convention Center in Houston. I-SWEEEP is the world’s largest international science fair focusing on energy, engineering, and environment, and after capturing the attention of many in the field, the girls took home the bronze medal in the engineering category, which came with a cash award.

Guidry and Nowakowski also won two special awards from the American Society of Civil Engineers (ASCE) Transportation and Development Institute (TDI) and from the Ricoh Americas Corporation. In addition, they were selected to compete in the 2016 Intel International Science and Engineering Fair (ISEF) this past May.

Through this experience, Guidry and Nowakowski explained that they now have a passion for science and research, and they are looking forward to their next step as students. They were even given the opportunity to further their exploration of glow-in-the-dark concrete after being approached by companies that would like to help them continue their research. This partnership would allow them to advance their design of their concrete with the help of professional engineers.

## Staff Updates and Accomplishments

LTRC Graduate Research Assistant **Moinul I. Mahdi** earned the prestigious Frank McCullough Award for Best Student Poster Board at the 11th International Conference on Concrete Pavements (ICCP) for his poster on “Construction and Performance Evaluation of Roller Compacted Concrete under Accelerated Testing,” beating out 25 other student presentations.

LTAP Director, **Marie Walsh**, Ph.D., participated in a Local Road Safety Data Peer Exchange in Seattle, WA and led a Towards Zero Deaths workshop during the recent National Working Summit on Rural Safety in Denver, CO. She was also the featured luncheon speaker at the Quarterly Louisiana Women Transportation Seminar and was invited to serve on the newly formed National ITE Steering Committee for the ITE Vision Zero Task Force.

**Steve Strength**, LTAP program manager, made technical presentations at the most recent Southern District ITE and Deep South ITE meetings and is serving as the chair of the NCHRP panel on, “Safety and Performance Criteria for Retroreflective Pavement Markers.”

LTAP Training Coordinator **Courtney Dupre** received a graphic design certificate from LSU Continuing Education in June, which allows her to use Adobe InDesign, Adobe Illustrator, Adobe Photoshop, and Web Design Basics as part of LTAP’s communication and outreach with local customers.

**Jalyn Moll**, LTAP senior student worker, is participating in the Chevron Leadership Academy for Engineers and attended the Regional leadership Conference of the National Society of Black Engineers.

LCTS Director **Dortha Cummins** attended the Traffic Records Forum last August 7-9, 2016, in Baltimore, Maryland. Over 300 highway safety and data professionals gathered to share experiences and learn tips from each other to improve traffic records across the board. This meeting is put together yearly by the Association of Traffic Safety Information Professionals (ATSIP).

LCTS is proud to welcome **Ashley Smithers** as its newest addition to the family. As the center’s research and administrative assistant, Smithers is tasked with assisting the research program management duties, coordinating safety initiatives to support the Strategic Highway Safety Plan (SHSP) projects, and performing departmental administrative functions.

LCTS Research Manager **Elisabeta Mitran** and Safety Initiatives Manager **Rudynah Capone** were among 600 highway safety professionals who gathered in Seattle last August 27-31, 2016, for the Governors Highway Safety Association (GHSA) Annual Meeting, hosted by the Washington Traffic Safety Commission. With a theme of “Crossroads: The Intersection of Technology and Driver Behavior,” general sessions focused on the ways in which rapidly advancing technologies pose both problems and solutions in highway safety.

Associate Director, External Programs **Vijaya (V.J.) Gopu**, Ph.D., P.E., presented technical papers at the 2016 World Conference on Timber Engineering held in Vienna, Austria, in August and the 2016 International Conference on Structural Engineering, Mechanics, and Composites held in Cape Town, South Africa in September. Dr. Gopu also served on three NSF proposal review panels and as a site visit team member for an NSF NHERI experimental facility.

# Recently Published



## **Project Capsule 16-ISA**

*Highway Construction Work Zone Safety Performance and Improvement in Louisiana*  
Helmut Schneider, Ph.D.

## **Project Capsule 16-5SA**

*Highway Work Zone Construction Safety Research and Training: A Driving Simulator Study*  
Yimin Zhu, Ph.D.

## **Project Capsule 17-IGT**

*Verification and Implementation of Set-up Empirical Models in Pile Design*  
Murad Y. Abu-Farsakh, Ph.D., P.E.

## **Technical Assistance Report 16-03TA-C**

*Evaluation of Cores from Jefferson Highway Near Airline Highway*  
Tyson Rupnow, Ph.D., P.E.; Zachary Collier, E.I.; and Amar Raghavendra, P.E.

## **Final Report and Technical Summary 566**

*Traffic Counting Using Existing Video Detection Cameras*  
Sherif Ishak, Ph.D., P.E.; Julius Codjoe, Ph.D.; Saleh Mousa; Sydney Jenkins; and Jennifer Bonnette

## **Final Report and Technical Summary 568**

*Development of Wave and Surge Atlas for the Design and Protection of Coastal Bridges in South Louisiana – Phase 2*  
D. Max Sheppard, Ph.D.; Philip E. Dompe, P.E.; Mark S. Gosselin, Ph.D., P.E.; and Hüseyin Demir, Ph.D.

## **Final Report and Technical Summary 569**

*Evaluation of Portland Cement Concrete with Internal Curing Capabilities*  
Tyson D. Rupnow, Ph.D., P.E.; Zachary Collier, E.I.; Amar Raghavendra, P.E.; and Patrick Icenogle, P.E.



### **FIND OUT MORE**

To view a complete list of LTRC publications, visit the website at [www.ltrc.lsu.edu](http://www.ltrc.lsu.edu).



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