

Technology Today

Volume 30 Issue 1

Fall 2015



A publication of the Louisiana Transportation Research Center

In this Issue

Louisiana Student Wins Prestigious UTC Award
2

LTRC Celebrates 30 Years
3

LTRC Represented at 95th Annual TRB Meeting
4

Staff Updates and Accomplishments
6

Recently Published
7

Upcoming Events

National Highway Institute (NHI) Course No. 142005 - NEPA and the Transportation Decision Making Process
April 5-7, 2016
TTEC 100

LPESA Spring Conference
May 5, 2016
TTEC 175

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

Thin RCC Pavements Found to Have High Load Carrying Capacity

Serving as an economical, fast-paving, and durable candidate for many heavy-duty pavement applications, roller compacted concrete (RCC) has recently gained the attention of pavement researchers in Louisiana. Over the past year, LTRC has been testing the load-carry capacity and performance of several full-scale RCC pavement test sections with the center's newest accelerated loading testing device, ATLaS30.

The RCC pavement sections (the structures of which were designed for low-volume pavements) have been made thinner by researchers to determine the thickness needed to survive under heavy truck trafficking in Louisiana, and the results have led to a cost-effective pavement design alternative and a new fatigue model for RCC thickness.

The research project, "Performance Evaluation of Thin RCC Pavements under Accelerated Pavement Testing,"

launched in response to DOTD's desire to find alternate uses of RCC for low-volume roadways in the oil and gas exploration areas in the northwest region of the state.

Leading the project, LSU Research Associate Professor and LTRC

Accelerated Pavement Research Program Manager Zhong Wu, Ph.D., P.E., explained, "RCC has traditionally been used for low-speed pavements such as



parking, storage areas, port and airport service areas, and intermodal and military facilities. However, with improved paving and compaction methods as well as surface texturing techniques, recent applications of RCC are found for interstate highway shoulders, city streets, and other highways."

Researchers discovered that all four RCC pavement test sections (with varying RCC slab thicknesses of 4 ~

cont. on pg. 1



Louisiana Student Wins Prestigious UTC Award

For the past 24 years, the U.S. Department of Transportation (USDOT) has honored an outstanding student from each University Transportation Center (UTC) for achievement in and contribution to transportation research and education. This year, the National Center for Intermodal Transportation for Economic Competitiveness (NCITEC) presented former LSU graduate student Sydney Jenkins with Outstanding Student of the Year at the Council of University Transportation Centers (CUTC) awards banquet during the Transportation Research Board winter meeting.

Students of the year are selected based on accomplishments in such areas as technical merit and research, academic performance, professionalism, and leadership. LSU Lloyd J. Guillory Professor of

Civil Engineering Sherif Ishak, Ph.D., nominated Jenkins for the honor. “I am proud and fortunate to have worked with her and served as her mentor for so long,” explained Dr. Ishak. “Sydney is a smart, highly-motivated, hard-working individual who has repeatedly demonstrated a great talent and potential for academic and professional success.”

While in graduate school, Jenkins was a member of Dr. Ishak’s transportation engineering research group. “We worked on a variety of projects involving traffic modelling and optimization, and intelligent transportation systems,” explained Jenkins. “My thesis topic involved studying human factors using naturalistic driving data that adds to the literature of distracted driving research.”

Along with the recognition and honor, Jenkins was able to attend TRB with all expenses covered and receive an additional stipend as a result of winning the award. She explained, “At the awards ceremony, I was able to hear our current Secretary of Transportation Anthony Foxx, and former Secretary Norman Mineta speak and encourage all of us to continue to pursue excellence in the field of transportation.”

Jenkins is no stranger to honors though, as she was awarded three fellowships in 2014 in order to fund her transportation engineering graduate studies: the Federal Highway Administration’s (FHWA) Dwight D. Eisenhower Transportation Graduate Fellowship, American Association of University Women’s Selected Professions Fellowship, and National Consortium for Graduate Degrees for Minorities in Engineering and Sciences’ Master Fellowship. Jenkins also completed three transportation-related internships at Oak Ridge National Laboratory, University of Texas at Austin, and the Federal Highway Administration.

Upon graduating in December 2015, Jenkins began work at the civil engineering consulting firm Kimley-Horn in Atlanta, GA. “I love working in transportation engineering because we directly impact the public and work very hard to improve their quality of life. Transportation is a vital element of human life, so I really enjoy the fact I work in an industry that can truly positively impact so many people,” explains Jenkins.

LTRC Celebrates 30 Years

This fall issue of Tech Today marks our 30th issue and anniversary for LTRC. For over 30 years, the staff of LTRC has strived to merge resources of state government and universities to help identify, develop, and implement new technology to improve the state's transportation system.

Over the last few decades, the center has evolved from a small state research department to a multi-facility center, boasting over 100 employees, both university and state alike, comprised of numerous state programs, research departments and laboratories, and as well as training resources.

Throughout the year, we will highlight some of the ways in which LTRC has assisted the Louisiana transportation system over the last 30 years by highlighting notable moments, proud accomplishments, input from past and current administration, as well as interesting tidbits accumulated along the way.

The value that the center has brought to the state exceeds savings in the millions through projects such as those focusing on high strength concrete, instrumental monitoring of structures,



and recycled asphalt pavements, just to name a few. In addition to the extensive research program, LTRC houses more essential programs and facilities than ever before, such as the Technology Transfer and Training Program; the Louisiana Local Technical Assistance Program; the Louisiana Pavement Research Facility, which houses the Accelerated Loading Facility and ATLaS 30; the Engineering Materials Characterization and Research Facility (EMCRF); the Geotechnical Engineering Research Laboratory (GERL); Pavement on the Move (POM); the Intelligent Transportation Systems (ITS) Laboratory; and the Louisiana Center for Transportation Safety (LCTS).

LTRC looks forward to celebrating the past, while also looking forward as the center continues to tackle new problems and challenges every day.



Watch our 30th Anniversary Video Online



Check out our latest video that takes a fresh look at the center's interworkings, goals, connections, and structure on our YouTube page. Visit [youtube.com](https://www.youtube.com) and search "Louisiana Transportation Center."

LTRC Represented at 95th Annual TRB Meeting

The Transportation Research Board (TRB) 95th Annual Meeting was held January 10–14, 2016, at the Walter E. Washington Convention Center, in Washington, D.C. The meeting program covered all transportation modes, with more than 5,000 presentations in nearly 800 sessions and workshops, addressing topics of interest to policy makers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions. More than 35 sessions and workshops focused on the spotlight theme for the 2016 meeting: *Research Convergence for a Multimodal Future*. And more than 75 addressed one or more of three hot topics: transformation technologies, resilience, and transportation and public health.

4

The following is a list of presentations made by LTRC staff members and contract researchers:

Micro-Encapsulation of Sunflower Oil as a Rejuvenator and Healing Agent in Asphalt Applications

Sharareh Shirzad, Marwa Hassan, Max Aguirre, Louay Mohammad, and William Daly

Application of Performance Tests During Asphalt Mixture Design

Louay Mohammad

Evaluation of Asphalt Mixture Cracking Resistance Using the Semi-Circular Bend Test at Intermediate Temperature

Louay Mohammad

Effect of Re-refined Engine Oil Bottoms on the Laboratory Performance of Asphalt Mixtures Containing Recycled Asphalt Shingles

Samuel Cooper, Jr., Louay Mohammad, and Mostafa Elseifi

Effects of Mixture Constituents and Reheating on the Mechanical Properties of Asphalt Mixtures

Samuel Cooper, III, Louay Mohammad, and Mostafa Elseifi

Effects of Temperature Segregation on the Quality and Fracture Resistance of Asphalt Pavements

Minkyum Kim, Louay Mohammad, Pranjali Phaltane, and Mostafa Elseifi

Development of a Predictive Model Based on Artificial Neural Network for the Semi-Circular Bend Test

Samuel Cooper, Jr., Samuel Cooper, III, Louay Mohammad, and Mostafa Elseifi

Exploration of SHRP 2 Naturalistic Driving Study: Development of Distracted Driving Prediction Model

Syndney Jenkins, Julius Codjoe, Ciprian Alecsandru, and Sherif Ishak

Estimating Traffic Volume of Nonstate Roadways with Support Vector Regression

Subasish Das, Xiaoduan Sun, and Charles Leboeuf

Improving Freight Crash Incident Management

Chester Wilmot, Stephen Glascock, Glen Graham, and Wan Li

Sustained-Flow Index: Stochastic Measure of Freeway Performance

Siavash Shojaat, Justin Geistefeldt, Scott Par, Chester Wilmot, and Brian Wolshon

GIS-based Method to Assess the Vulnerability of Disadvantaged Populations During Hurricane Evacuation from New Orleans

Chester Wilmot and Ruijie Bian

Performance Evaluation of Thin RCC Pavements under Accelerated Pavement Testing

Zhong Wu, Moinul Mahdi, and Tyson Rupnow

Research Implementation of AASHTO Pavement ME Design in Louisiana

Zhong Wu, Danny Xiao, and Zhongjie Zhang

Longitudinal Cracking of Jointed Plain Concrete Pavements in Louisiana

Danny Xiao, Zhong Wu, Moinul Mahd., and Zhongjie Zhang

Development Field Skid Resistance Production Procedure for Louisiana Pavements

Yogendra Pd. Subedi and Zhong Wu

Evaluation of Self-Healing Mechanisms in Cement Mortar with Calcium Nitrate Microcapsules

Gabriel Arce, Marwa Hassan, Louay Mohammad, and Tyson Rupnow

Micro-Encapsulation of Calcium Nitrate for Concrete Applications

Marwa Hassan, Jose Milla, Tyson Rupnow, Mansoor Al-Ansari, and William Daly

Evaluation of the Effect of Self-Healing Calcium Nitrate Microcapsules on Concrete Properties

Jose Milla, Marwa Hassan, Tyson Rupnow, Mansoor Al-Ansari, and Gabriel Arce

3D Measurement of Pavement Macrotecture Using Digital Stereoscopic Vision

Marcelo Medeiros, Shane B. Underwood, Cassie Castorena, Tyson Rupnow, and Mary Rawls

Results from the Accelerated Load Testing of RCC Pavements

Tyson Rupnow, Zhong Wu, and Moinul Mahdi

Evaluation of Setup for Individual Soil Layers and Development of a Model to Estimate Increase in Unit Side Resistance with Time Based on PCPT Data

Md. Nafiul Haque, Murad Y. Abu-Farsakh, Zhongjie Zhang, and Ayman M.

Correlation of Consolidation Parameters (and OCR) of Cohesive Soils with PCPT Data

Murad Y. Abu-Farsakh, Rohit Pant, and Md. Nafiul Haque

Performance of Geosynthetic-Reinforced and Stabilized Paved Roads Built over Soft Soil under Cyclic Plate Loads

Murad Y. Abu-Farsakh, Shadi Hanandeh, Louay N. Mohammad, and Qiming Chen

Field Demonstration of New Bridge Approach Slab Designs and Performance

Murad Y. Abu-Farsakh and Qiming Chen, Ph.D., P.E

Evaluating the Lateral Behavior of Battered Pile Group Foundation Using 3D Finite Element Modeling

Ahmad Souri, Murad Y. Abu-Farsakh, and George Voyiadjis

Laboratory Characterization of Geosynthetic-Reinforced Two-Layer Base-Subgrade Composite Materials under Monotonic and Cyclic Loading

Murad Y. Abu-Farsakh, Qiming Chen, Zachary Autin, and Imran Akond

Instrumentation and Short-Term Performance Monitoring of Geosynthetic Reinforced Soil Integrated Bridge System

Milad Saghebfar, Murad Y. Abu-Farsakh, Allam Ardah, and Qiming Chen

Thin RCC Pavements Found to Have High Load Carrying Capacity

cont. from pg. 1

6 in. and two soil cement base types) had very high load-carrying capacities. However, while three RCC sections were able to load until a fatigue cracking failure, the fatigue cracks were found to initiate originally in the longitudinal direction at a location either in the middle of a tire print or at the edge of the tire print. “With continuous load repetitions and the crack pumping actions of fine materials, voids began to be formed underneath a RCC slab, which would generate more slab-bending and deflections, and gradually propagate cracks into a fatigue cracking failure,” Dr. Wu explains. “Due to the combination effects of slab thickness and base/subgrade support, the final fatigue cracking pattern was found much wider in a thicker RCC section than that in a thinner RCC section.”

Another deliverable from the study comes in the form of a new RCC fatigue model. “The current RCC fatigue models in the literature were derived for the design of RCC industrial, heavy-duty pavements with a minimum RCC thickness of 8 in., which may be not suitable for a thin RCC-surfaced pavement design,” explains Dr. Wu. “Based on the accelerated pavement testing performance of the RCC sections, a set of fatigue prediction equations will be developed from this study. The developed models will be better suited in the predicting of fatigue damage for a thin RCC-surfaced pavement over a soil cement base, which can be used as a cost-effective pavement design alternative for low-volume roadways where heavy truck trafficking may be often encountered.”

To learn more or read in depth the details of the project, please contact Dr. Zhong Wu at (225) 767-9163 or zhongwu@ltrc.lsu.edu or Moinul Mahdi at (225) 614-8874 mmahdi2@tigers.lsu.edu.

Staff Updates and Accomplishments

LTRC’s Louisiana Center for Transportation Safety (LCTS) recently hired **Kristi Miller** to serve as its Workforce Development Manager and **Elisabeta “Eli” Mitran, Ph.D.**, to serve as its Research Manager.

Julius Codjoe, Ph.D., was hired in the Special Studies Research group as an ITS/Traffic Research Associate.

Special Studies Research Administrator **Kirk Zeringue, P.E.**, was selected by TRB for membership on NCHRP Project Panels 20-102(09) Providing Support to the Introduction of CV/AV Impacts into Regional Transportation Planning and Modeling Tools and 20-102(07) Implications of Automation for Motor Vehicle Codes.

Sandra Brady, Librarian & Transportation Research Advisor, was elected Secretary for the Special Libraries Association, Transportation Division.

LSU Civil Engineering Professor and EMCRF Manager **Louay Mohammad, Ph.D.**, delivered an invited presentation at the National Asphalt Pavement Association Talks Webinar Series Effects of Temperature Segregation on the Quality of Asphalt Pavements, January 20, 2016.

Recently Published

Project Capsule 16-4B

Evaluation of Non-SBS Modified Binders using the Multiple Stress Creep Recovery Test
Samuel B. Cooper, III, Ph.D., P.E.

Project Capsule 15-1GT

pLog Enterprise-Enterprise GIS-Based Geotechnical Data Management System Enhancements
Scott L. Deaton, Ph.D.

Project Capsule 15-3SA

Investigating Safety Impact of Centerline Rumble Strips, Lane Conversion, Roundabout and J-Turn Features on Louisiana Highways
Xiaoduan Sun, Ph.D., P.E.

Project Capsule 14-2ST

Development of a Sustainable UHPC Bridge Deck for Movable Bridges
Fatmir Menkulasi, Ph.D., P.E.

Project Capsule 15-ISA

Exploring Naturalistic Driving Data for Distracted Driving Measures
Sherif Ishak, Ph.D.

Project Capsule 15-1B

Evaluation of Crumb Rubber Modification of Louisiana Mixtures
Samuel B. Cooper, III, Ph.D., P.E.

Final Report and Technical Summary 545

Development of Minimum State Requirements for Local Growth Management Policies—Phase I
John L. Renne, Ph.D., and Tara M. Tolford

Final Report and Technical Summary 548

Developing a Method for Estimating AADT on All Louisiana Roads
Xiaoduan Sun, Ph.D., P.E., and Subasish Das



Final Report and Technical Summary 551

Development of DARWin-ME Design Guideline for Louisiana Pavement Design
Zhong Wu, Ph.D., P.E., and Danny X. Xiao, Ph.D., P.E.

Final Report and Technical Summary 556

Identifying Local Transit Resources for Evacuation
Chester Wilmot, Ph.D., P.E., Ruijie Bian, Marlon Greensword, and Alaa Shams

TIRE Report 14-2

Hurricane Hazard Mitigation in Traffic Light Support Structures
Aly Mousaad Aly, Ph.D., Hamzeh Gol Zaroudi, and Milad Rezaee



FIND OUT MORE

To view a complete list of LTRC publications, visit the website at www.ltrc.lsu.edu.



Louisiana Transportation Research Center

4101 Gourrier Avenue
Baton Rouge, LA 70808-4443
DOTD Section 33

Pre-Sort Standard
U.S. Postage
PAID
Permit No. 936
Baton Rouge, LA

www.ltrc.lsu.edu

Technology Today Publication Statement

Technology Today is a quarterly publication of the Louisiana Transportation Research Center, administered jointly by the Louisiana Department of Transportation and Development and Louisiana State University.

For additional information on material included in this newsletter, contact the public information director at 225.767.9183.



Follow us at www.twitter.com/LTRC_Updates,
and search for us at www.facebook.com.

LTRC Administration and Publications Staff

Sam Cooper, Ph.D., P.E., Director
Tyson Rupnow, Ph.D., P.E., Associate Director, Research
Vijaya (VJ) Gopu, Ph.D., P.E., Associate Director, External Programs

Jenny Speights, Public Information Director
Emily Wolfe, Multi-Media Specialist
Jenny Gilbert, Editor/Technical Writer
Laura Williams, Editorial Assistant

This public document is published at a total cost of \$553.40. One thousand and one hundred copies of the public document were published in this first printing at a cost of \$553.40. The total cost of all printings of this document, including reprints, is \$553.40. This document was published by Printing Tech, 11930 South Harrell's Ferry Road, Baton Rouge, to report on the research and training of the Louisiana Transportation Research Center, as required in R.S. 48:105. This material was duplicated in accordance with standards for printing by state agencies, established pursuant to R.S. 43:31. Printing of this material was purchased in accordance with the provisions of Title 43 of the Louisiana Revised Statutes.