





Shawn D. Wilson, Ph.D.  
Secretary



F. King Alexander, Ph.D.  
LSU President

The Louisiana Transportation Research Center (LTRC) is a research, technology transfer, and training center administered jointly by the Louisiana Department of Transportation and Development (DOTD) and Louisiana State University (LSU). LTRC provides a setting in which the thresholds of technology can be explored and applied in practical ways. By merging the resources of DOTD and LSU, a versatile core of facilities and expertise addresses the rapidly evolving challenges in the transportation field.

In addition to its affiliation with LSU, LTRC participates fully with other universities in Louisiana that house engineering programs (Louisiana Tech University, McNeese State University, Southern University, Tulane University, University of Louisiana at Lafayette, and University of New Orleans). By combining their resources with those of DOTD, the center eliminates duplication of effort and provides a richer base of support. The center also provides an avenue for multi-disciplinary support from universities to meet the practical and academic needs of the transportation industry in such areas as engineering, law, business and management, basic sciences, planning, and environmental studies.

Since its creation by the Louisiana legislature in 1986, LTRC has gained national recognition through its efforts to improve transportation systems in Louisiana. The center conducts short- and long-term research and provides technical assistance, training, continuing education, technology transfer, and problem-solving services to DOTD and the transportation community at large. The center is largely supported through funding authorized by DOTD and the Federal Highway Administration (FHWA).

LTRC merges the resources of the state and local government, universities, and private industry to identify, develop, and implement new technology to improve the state's transportation system. By harnessing these valuable resources, LTRC is empowered to find innovative solutions to Louisiana's transportation problems.

The LTRC Foundation, a non-profit organization, enhances the center as the focus for transportation-related research, technology transfer, and education in Louisiana. The foundation provides an excellent partnership opportunity for DOTD, state universities, and the private sector.

In these and other ways, LTRC is paving the way for more efficient and beneficial research and training, thanks to a combination of modern techniques, locally available resources, and a wide pool of support.

*This publication is a report of the transportation research, technology transfer, education, and training activities of the Louisiana Transportation Research Center for July 1, 2016–June 30, 2017. The center is sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University.*

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# FACILITIES



*(left to right) LTRC; Transportation Training and Education Center; Accelerated Loading Facility*

Located on the LSU campus in Baton Rouge, LTRC provides researchers and students access to excellent laboratories and state-of-the-art research equipment. The full resources of LSU as a Carnegie Designated Doctoral/Research Extensive Institution are also available. The unique position of LTRC provides access to virtually all of LSU and DOTD's resources to pursue the center's mission.

LTRC houses more than 90 employees and up to 30 students in two adjacent facilities. The LTRC building is a 25,300-square foot facility that includes five research laboratories, a conference room, and offices. The laboratories are used to conduct advanced research into asphalt, concrete, soils, and pavements. The 14,000-square foot Transportation Training and Education Center (TTEC) houses a lecture hall, a computer-based training classroom, and two general classrooms that are all equipped with advanced education and training equipment and distance learning/video-conferencing capabilities. A comprehensive transportation library, executive conference room, and offices are also included.

The addition of TTEC greatly enhances LTRC's mission by facilitating the delivery of training, professional development opportunities, and technology transfer to engineers, technicians, undergraduate and graduate students, and professionals from both the public and private domains.

LTRC has identified research areas of strategic importance and has developed expanded capabilities for concentration in several areas: the Engineering Materials Characterization Research Facility (EMCRF),

a laboratory facility specializing in fundamental materials characterization; the Geotechnical Engineering Research Laboratory (GERL), a laboratory focusing on transportation earth-works, structural foundations, and geosynthetics; Pavement on the Move (POM), a multi-use mobile laboratory for collecting data from field construction projects as well as research and training; and the Intelligent Transportation Systems (ITS) lab, the newest lab designed to evaluate traffic data collected from Louisiana's traffic management centers. Although remote from the center, the Louisiana Pavement Research Facility is an important facility that streamlines pavement loading research by compressing years of road wear into months of testing. The six-acre facility is located on the west side of the Mississippi River and incorporates an Accelerated Loading Facility (ALF™) for testing flexible pavements and our ATLaS30 for testing rigid pavements.

LTRC is a budget division of the Louisiana Department of Transportation and Development. Funding is a combination of State, State Planning and Research (Part II, Federal), Innovative Bridge Research and Deployment (Federal), Surface Transportation Program (STP-Federal), and external contracts and grants, such as the National Cooperative Highway Research Program, Federal Agency Grants, and the National Science Foundation.

# DIRECTOR'S MESSAGE

*It is with great pleasure that I present the 2016 -2017 LTRC Annual Report.*

Inside this report, you will find featured articles on the research program, technology transfer and training, and technology transfer activities. In addition, you will find completed and active research projects, training accomplishments, support of higher education, publications, and presentations.



LTRC is committed to the support of higher education and solving Louisiana's transportation problems.

Within this annual report, it is shown that LTRC is sponsoring 60 active research projects and has completed an additional 23 research projects. In addition, LTRC is a partner and a site for the newly awarded University Transportation Center led by LSU. The Transportation Consortium of South-Central States (Trans-SET) has 11 sites within Louisiana, Oklahoma, Texas, New Mexico, and Arkansas. The theme of the center is Solving Emerging Transportation Resiliency, Sustainability and Economic Challenges through the Use of Innovative Materials and Construction Methods: From Research to Implementation ([www.transet.lsu.edu](http://www.transet.lsu.edu)). Also, Louisiana is the lead state in the Southeast Transportation Consortium, which is a Federal Highway Administration pool fund collaborative effort between the 12 SASHTO states.

LTRC continues to focus on solving transportation infrastructure problems. Results from a recently completed research project were successfully implemented by the Lafayette Consolidated Government (LCG). This project investigated internally cured (IC) concrete produced for bridge structures in an effort to improve the quality of concrete structures. This research also investigated the use of differing percentages of lightweight aggregate for internal curing benefits as well as additional methods for determining the available moisture on saturated lightweight aggregates. As part of the project, a five-span bridge on West Congress Street in Lafayette was selected by DOTD and LCG. Spans 1 and 5 incorporated concrete with IC and the remaining control slabs (2, 3, and 4) utilized concrete without IC. Results indicated that cracks were visible in some of the control concrete; whereas, there are no cracks in any of the concrete with IC. Based on these results, LCG has modified its bridge specification to include internal curing in all of its new bridges, which includes all exposed concrete, guardrail wall, approach slabs, deck surfaces, and diaphragms.

Some additional highlights of the 2016-2017 LTRC Annual Report are as follows:

- 2016 marked LTRC's 30th anniversary
- TRAC & RIDES Programs
- Approximately 13,000 individuals, both internal (DOTD) and external (state, local, federal, and transportation industry partners), received training hosted by LTRC.
- In the area of Technology Transfer, LTRC published 15 final reports, 15 technical summaries, 19 project capsules, 1 technical assistance reports, and 4 Technology Today newsletters.

Please feel free to follow LTRC's latest news via our website, [www.ltrc.lsu.edu](http://www.ltrc.lsu.edu), and through social media.

Respectfully submitted,  
Samuel B. Cooper, Jr., Ph.D., P.E., Director

# COMPLETED RESEARCH

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## Bituminous (Asphalt)

- 12-1B: Evaluation Of Asphalt Mixtures Containing Recycled Asphalt Shingles  
Principal Investigator: Louay Mohammad/Agency: LTRC
- 12-4B: Performance of WMA Technologies: Stage II – Long-term Field Performance  
Principal Investigator: Louay Mohammad/Agency: LTRC
- 14-1B: Effects of Temperature Segregation on the Quality of Asphalt Mixtures  
Principal Investigator: Louay Mohammad/Agency: LTRC
- 16-4B: Evaluation of Non-SBS Modified Binders using the Multiple Stress Creep Recovery Test  
Principal Investigator: David Mata/Agency: LTRC
- 16-5B: DOTD Support for UTC Project: Ductility of Extreme-Temperature Asphalt Binders by Shear and Extensional Rheology, Principal Investigator: Nazimuddin Wasiuddin/Agency: Louisiana Tech University

## Concrete

- 13-1C: Evaluation of MIT-SCAN-T2 for Thickness Quality Control for PCC and HMA Pavements  
Principal Investigator: Tyson Rupnow/Agency: LTRC
- 14-5C: DOTD Support for UTC Project: Development of Rapid PCC Pavement Repair Materials and Construction Techniques, Principal Investigator: Hak-Chul Shin/Agency: Southern University
- 16-2C: Reliable Early Opening Strength for Concrete Pavements and Patch Work  
Principal Investigator: Zachary Collier/Agency: LTRC

## Geotechnical

- 13-7GT: Support Study to ITRS proposal on “An Integrated Computational and Experimental Study of Pile Setup in Soft Clays,” Principal Investigator: Murad Abu-Farsakh/Agency: LTRC
- 15-2GT: Lime Utilization in the Laboratory, Field, and Design of Pavement Layers  
Principal Investigator: Mostafa Elseifi/Agency: LSU
- 15-3GT: Calibration of LRFD Geotechnical Axial (Tension and Compression) Resistance Factors for California, Principal Investigator: Murad Abu-Farsakh/Agency: LTRC
- 16-5GT: Corrosion Map for Metal Pipes in Coastal Louisiana  
Principal Investigator: Sanjay Tewari/Agency: Louisiana Tech University

# COMPLETED RESEARCH

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## Special Studies

- 14-5SS: LTRC Project Management and Tracking System Upgrade  
Principal Investigator: Adele Lee/Agency: LTRC

## Structures

- 13-4ST: I-10 Girder Repair Using Post-Tensioned Steel Rods and Carbon Fiber Composite Cables (CFCC), Principal Investigator: Ching Tsai/Agency: LTRC

## Transportation Innovation for Research Exploration (TIRE)

- 17-1TIRE: Advanced Modeling of Piezocone Penetration Test Using Cavity Expansion Theory and Interpretation Simulator Development, Principal Investigator: Shengli Chen/Agency: LSU
- 17-2TIRE: Drones for Automatic Pothole Detection and Road Construction Monitoring  
Principal Investigator: Supratik Mukhopadhyay/Agency: LSU
- 17-3TIRE: Design and Investigation of a Fuel-Flexible Injection System for Low-Emission Vehicles  
Principal Investigator: Lulin Jiang/Agency: University of Louisiana at Lafayette
- 17-4TIRE: A Data-driven Framework for Damage Diagnosis and Prognosis of Coastal Bridges  
Principal Investigator: Sun Chao/Agency: LSU
- 17-5TIRE: Failure Prevention for Sensitized Structural Alloys Used in Coastal Transportation  
Principal Investigator: Gabriela Petculescu/Agency: University of Louisiana at Lafayette

## Pavement

- 12-7P: Roller Compacted Concrete Over Soil Cement Under Accelerated Loading  
Principal Investigator: Zhong Wu/Agency: LTRC

## Safety

- 14-2SA: Factors Influencing Seatbelt Utilization in Louisiana and Strategies to Improve Usage Rate  
Principal Investigator: Helmut Schneider/Agency: LSU
- 15-1SA: Exploring Naturalistic Driving Data for Distracted Driving Measures  
Principal Investigator: Sherif Ishak/Agency: LSU

## Pooled Fund

- 15-1PF: Prep-ME Software Implementation and Enhancement  
Principal Investigator: Joshua Li/Agency: Oklahoma State University

# ACTIVE RESEARCH

## Bituminous (Asphalt)

|       |  |                       |      |
|-------|--|-----------------------|------|
| 14-2B | Field Implementation of the Louisiana Interface Shear Strength Test  | Louay Mohammad        | LTRC |
| 15-1B | Evaluation of Crumb Rubber Modification of Louisiana Mixtures  | Samuel B. Cooper, III | LTRC |
| 15-2B | Support Study for Evaluation of Crumb Rubber Modification of Louisiana Mixtures                                  | William H. Daly       | LSU  |
| 16-5B | DOTD Support for UTC Project: Ductility of Extreme-Temperature Asphalt Binders by Shear and Extensional Rheology | Nazimuddin Wasiuddin  | LTU  |
| 17-2B | Evaluation of Non-Destructive Density Determination for QA/QC Acceptance Testing                                 | David Mata            | LTRC |
| 17-3B | DOTD Support for UTC Project: Development of a Revised RTFO Protocol for Foam-Based Warm Mix Asphalt             | Nazimuddin Wasiuddin  | LTU  |
| 17-4B | Development of a 4.75mm Asphalt Mixture Design   | Saman Salari          | LTRC |

## Concrete

|       |  |                  |                     |
|-------|--|------------------|---------------------|
| 14-1C | Evaluation of Dowel Bar Alignment and Effect on Long Term Performance of Jointed Concrete Pavements          | Tyson Rupnow     | LTRC                |
| 14-4C | Evaluation of Bonded Concrete Overlays over Asphalt under Accelerated Loading                                | Tyson Rupnow     | LTRC                |
| 14-5C | DOTD Support for UTC Project: Development of Rapid PCC Pavement Repair Materials and Construction Techniques | Hak-Shul Shin    | Southern University |
| 16-1C | Radio-frequency Identification (RFID) Tagging for Material Tracking and Future Asset Management              | Amar Raghavendra | LTRC                |
| 17-1C | Effect of Clay Content on Alkali-Carbonate Reactive (ACR) Dolomitic Limestone                                | Amar Raghavendra | LTRC                |

## Special Studies

|        |  |                               |                      |
|--------|--|-------------------------------|----------------------|
| 10-6SS | Establishing an Intelligent Transportation Systems (ITS) Lab at LTRC (Phase II)                      | Sherif Ishak                  | LSU                  |
| 16-5SS | Diverted Traffic Measurement   | Ravindra Gudishala            | LTRC                 |
| 15-2SS | Cost and Time Benefits for using Subsurface Utility Engineering in Louisiana                         | Kirk Zeringue                 | LTRC                 |
| 14-3SS | Development of a Mode Choice Model to Estimate Evacuation Transit Demand                             | Chester Wilmot                | LTRC                 |
| 17-1SS | Economic Evaluation of Applicants to the Port Construction and Development Priority Program          | James Richardson              | LSU                  |
| 17-3SS | Hurricane Evacuation Modeling Package  | Chester Wilmot                | LSU                  |
| 17-4SS | Dredging Louisiana's Navigable Waterways - A Statewide Systematic Approach to Meeting Dredging Needs | Mohan Menon                   | GIS Engineering, LLC |
| 17-5SS | Development of Guidelines for Ramp Metering Implementation and Performance Evaluation on I-12        | Sherif Ishak                  | LSU                  |
| 17-6SS | Evaluation of HeadLight: An E-Construction Inspection Technology                                     | Tyson Rupnow & Mary Leah Coco | LTRC                 |

# ACTIVE RESEARCH

## Structures

|        |  |                  |  |
|--------|--|------------------|--|
| 16-3ST | Live Load Rating of Cast-in-Place Concrete Box Culverts in Louisiana                         | Ayman Okeil      | LSU                                      |
| 16-2ST | Field Monitoring and Measurements Education: A Model for Civil and Environmental Engineering | Vijaya Gopu      | LTRC                                     |
| 15-3ST | Rehabilitation of Deteriorated Timber Piles using Fiber Reinforced Polymer (FRP) Composites  | Hota GangaRao    | West Virginia University                 |
| 14-1ST | Evaluating Louisiana New Continuity Detail for Girder Bridges                                | Ayman Okeil      | LSU                                      |
| 16-1ST | Retrofit of Existing Statewide Louisiana Safety Walk Bridge Barrier Railing Systems          | William Williams | Texas A&M Transportation Institute (TTI) |
| 16-4ST | Overheight Impact Avoidance and Incident Detection System                                    | George Voyiadjis | LSU                                      |

## Geotechnical

|        |   |                   |                             |
|--------|---|-------------------|-----------------------------|
| 11-3GT | Accelerated Load Testing of Geosynthetic Base Reinforced Pavement Test Sections   | Murad Abu-Farsakh | LTRC                        |
| 13-3GT | Finite Element Analysis of the Lateral Load Test on Battered Pile Group at I-10 Twin Span Bridge                                    | Murad Abu-Farsakh | LTRC                        |
| 13-5GT | Monitoring of In-Service Geosynthetic Reinforced Soil (GRS) Bridge Abutments in Louisiana   | Murad Abu-Farsakh | LTRC                        |
| 13-9GT | CORS 911: Continuously Operating Reference Stations for the Bayou Corne Sinkhole  | Joshua Kent       | LSU                         |
| 15-1GT | pLog Enterprise - Enterprise GIS-Based Geotechnical Data Management System Enhancements   | Scott Deaton      | Dataforensics, LLC          |
| 16-5GT | Corrosion Map for Metal Pipes in Coastal Louisiana  | Sanjay Tewari     | LTU                         |
| 16-1GT | LADOTD Geotechnical Design Manual   | Ed Tavera         | GeoStellar Engineering, LLC |
| 16-6GT | Incorporating the Site Variability and Laboratory/In-situ Testing Variability of Soil Properties in Geotechnical Engineering Design | Murad Abu-Farsakh | LTRC                        |
| 17-1GT | Verification and Implementation of Set-Up Empirical Models in Pile Design   | Murad Abu-Farsakh | LTRC                        |
| 17-2GT | Update the Pile Design by CPT Software to Incorporate Newly Developed Pile-CPT Methods and Other Design Features                    | Murad Abu-Farsakh | LTRC                        |

## Pooled Fund

|        |   |                |                          |
|--------|---|----------------|--------------------------|
| 14-5PF | Design and Analysis Procedures for Asphalt Mixtures Containing High-RAP Contents and/or RAS | Louay Mohammad | LTRC                     |
| 16-1PF | Development of a Guidebook for Determining the Value of Research Results                    | Yoojung Yoon   | West Virginia University |

# ACTIVE RESEARCH

## Pavement

|        |   |                  |      |
|--------|---|------------------|------|
| 12-11P | Field Validation of Equivalent Modulus for Stabilized Subgrade Layer  | Mark Martinez    | LTRC |
| 12-1P  | Assessment of Pavement Distresses caused by Trees on Rural Highway  | Kevin Gaspard    | LTRC |
| 12-2P  | Assessment of Environmental, Seasonal and Regional Variations in Pavement Base and Subgrade Properties                  | Kevin Gaspard    | LTRC |
| 12-3P  | Minimizing Shrinkage Cracking in Cement-Stabilized Bases Through Micro-Cracking   | Zhong Wu         | LTRC |
| 14-2P  | Assessment of Structural Capacity Indicators from Rolling Wheel Deflectometer Data Collection in Louisiana              | Mostafa Elseifi  | LSU  |
| 16-6P  | Quality Management of Cracking Distress Survey in Flexible Pavements Using LTRC Digital Highway Data Vehicle            | Zhong Wu         | LTRC |
| 16-2P  | Transportation Infrastructure Asset Damage Cost Recovery Correlated with Shale Gas/Oil Recovery Operations in Louisiana | Zhong Wu         | LTRC |
| 16-5P  | Pavement Service Life Extension Due to Asphalt Surface Treatment Interlayer   | Mohammad Khattak | ULL  |
| 17-1P  | Improving the Use of Crack Sealing to Asphalt Pavement in Louisiana   | Mostafa Elseifi  | LSU  |
| 17-2P  | Implementation of a Localized Roughness Specification for use on Louisiana Bridges                                      | Mark Martinez    | LTRC |
| 17-3P  | A Decision-Making Tool for Incorporating Sustainability Measures into Pavement Design                                   | Marwa Hassan     | LSU  |

## Safety

|        |  |                          |      |
|--------|--|--------------------------|------|
| 15-3SA | Investigating Safety Impacts of Centerline Rumble Strip, Lane Conversion, Roundabout and J-turn Features on Louisiana Highways | Xiaoduan Sun             | ULL  |
| 15-2SA | Development of a Simulation Test Bed for Connected Vehicles using the LSU Driving Simulator                                    | Sherif Ishak             | LSU  |
| 15-1SA | Exploring Naturalistic Driving Data for Distracted Driving Measures  | Sherif Ishak             | LSU  |
| 16-3SA | Evaluating Cell Phone Data for AADT Estimation   | Julius Codjoe            | LTRC |
| 16-1SA | Highway Construction Work Zone Safety Performance and Improvement in Louisiana   | Helmut Schneider         | LSU  |
| 16-4SA | Pedestrians and Bicyclists Count: Developing a Statewide Multimodal Count Program  | Tara Tolford, MURP, AICP | UNO  |
| 16-5SA | Highway Work Zone Construction Safety Research and Training: A Driving Simulator Study   | Yimin Zhu                | LSU  |
| 17-1SA | Evaluating the Effectiveness of Regulatory and Warning Signs on Driver Behavior near Highway/Rail crossings                    | Julius Codjoe            | LTRC |
| 17-2SA | Support Study for Pedestrians and Bicyclists Count: Developing a Statewide Multimodal Count Program                            | Julius Codjoe            | LTRC |

# RESEARCH HIGHLIGHTS

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## *LTRC Partners with a New Regional University Transportation Center to Support DOTD Research Needs*

As one of the sites for the newly awarded LSU-led Transportation Consortium of South-Central States (Tran-SET)—a regional University Transportation Center (UTC) funded by the U.S. Department of Transportation (USDOT)—LTRC will receive approximately \$300,000 a year for five years to conduct research projects of interest and value to DOTD.

LTRC is one of 11 Tran-SET sites scattered across Louisiana, Oklahoma, Texas, New Mexico, and Arkansas. “We will be receiving approximately \$1.5 million from the regional UTC [Tran-SET] over the next five years and will be able to fund approximately 15 or more projects valued at \$3 million over the same period. The excess funds will be generated through matching provided by participating universities and LTRC,” said Associate Director of External Programs, Vijaya Gopu, Ph.D., P.E. “Tran-SET and its sites in Louisiana will be supporting research activities that will address some critical research needs of Louisiana DOTD in particular and of the region in general. The specific projects that need to be conducted will be identified soon and will support DOTD research needs and the theme of the regional UTC.”

Awarded as a multimillion-dollar grant from USDOT, Tran-SET is spearheaded by LSU’s Bert S. Turner Department of Construction Management Professor Marwa Hassan, Ph.D., P.E., and the LTRC site principal investigators are Director Sam Cooper, Jr., Ph.D., P.E., and Associate Director of Research Tyson Rupnow, Ph.D., P.E.

“The vision, in partnership with major state authorities in Louisiana and the region and organization, including experts from state authorities and the private sector, will allow Tran-SET to become a transportation focal point in the region,” said Dr. Hassan. “The advisory board will guide the center’s leadership in prioritizing local and regional problems. DOTD Deputy Secretary Dr. Eric Kalivoda has graciously agreed to serve as the chair of the Tran-SET’s advisory board.”

Tran-SET will work to solve regional challenges resulting from tight economic conditions through an innovative approach focusing on cutting-edge materials, innovations, and construction methodologies as well as their applications to the different components of the transportation infrastructure (roads, ports, rails, and bridges). The center will address economic limitations by mainly considering research topics that carry out a viable plan to move the technology from research to implementation, including workforce training and specifications development.

“With limited funding and the downsizing of transportation agencies due to challenging economic conditions, the backlog of transportation projects in Louisiana and Region 6 as a whole has reached alarming levels and continues to grow. It is clear that addressing these challenges with a ‘business as usual’ approach will only cause the backlog to grow to unmanageable levels,” said Dr. Hassan.

“The vision of the proposed center is to tackle the accelerated deterioration of the different components of the transportation infrastructure in Louisiana and Region 6 through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes in current and future transportation projects.”

The consortium comprises Arkansas State University, Baton Rouge Community College, Louisiana State University (and LTRC), Navajo Technical University, New Mexico State University, Oklahoma State University, Prairie View A&M University, Texas A&M University, University of New Mexico, University of Texas at Arlington, and University of Texas at San Antonio.

# RESEARCH HIGHLIGHTS

## *LTRC Impacts Highlighted for 30<sup>th</sup> Anniversary*

In March 2017, LTRC speakers gathered to showcase their section's strengths and contributions to the state and local universities. From training to research, current and former employees, administrators, and directors were given a snapshot of why LTRC has been a leader in providing quality research and educational opportunities to the transportation community for the past 30 years. In addition to this event, LTRC had an opportunity to mark its significant research contributions in an impact report. Selected highlights from the research section and are included here; technology transfer/training highlights are found on pages 12-13. You can download the full reports at [www.ltrc.lsu.edu/anniversary](http://www.ltrc.lsu.edu/anniversary).



### **1980-85**

- The use of reclaimed asphalt pavement (RAP) was investigated and the results were implemented, saving on the cost of virgin materials for the last 37 years. Conservatively considering that DOTD paves 2 million tons of asphalt concrete per year and that asphalt concrete is approximately 5% asphalt cement and 95% aggregate, DOTD has saved over \$300 million with the implementation of these results.

### **1985-1990**

- The use of weigh-in-motion scales (WIMs) were investigated and implemented, with 12 currently in use today. WIMs provide better data than static scales and an increased sample size with reduced manpower.
- The use of silica fume for concrete mixtures was investigated and implemented, leading to high-strength, durable, dense concrete mixtures for structural applications.

### **1990-95**

- The Pavement Research Facility (PRF) was formed and an Accelerated Loading Facility (ALF) was purchased. The interlayer base section was investigated, compared to eight other base sections, and found to be the most efficient. Results also showed that the pavement life for the interlayer system was about five times longer than current design methodologies of the day. The interlayer base section, also called an inverted pavement structure, is still in use and favored heavily in current design methodology, allowing crack relief from underlying soil cement.
- Research results showed that the existing 3 ½-in. diameter, single post, multi-directional slip base sign support met the AASHTO criteria. Therefore, DOTD was not required to remove and replace thousands of existing signs, thus saving the Department millions of dollars. This design is still used today by DOTD.

### **1995-2000**

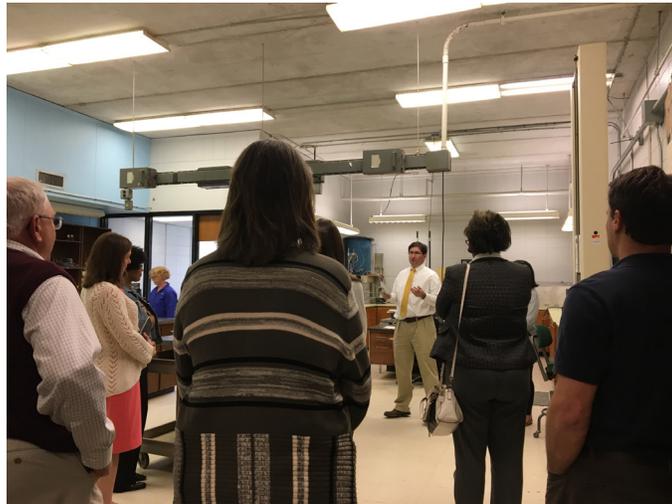
- A speed limit study evaluated which roads could accommodate a higher speed limit, leading to the current 70 mph speed limit on urban and controlled-access interstate systems across Louisiana.
- A geotechnical study showed that geotextile fabrics, when designed and used properly, can mitigate slope failures in heavy clays. Videos were developed to aid maintenance forces in maintaining these problematic slopes today.

# RESEARCH HIGHLIGHTS

- SuperPave asphalt mixture design was investigated and implemented specifically intending to reduce rutting and cracking failures in flexible pavement sections.

## **2000-2005**

- The first comprehensive study of traffic safety was completed showing that small reductions in roadway crashes can translate to enormous costs savings to the state. Results showed that a 4.5% reduction in crashes would translate to saving approximately 40 lives per year.
- Pavement research updated the PMS by developing better, updated models that assist DOTD network and project-level PMS decision making efforts in planning and recommending appropriate maintenance and rehabilitation activities.
- Implementation of geotechnical research increased the use of treated subgrade layers and introduced target strengths. This work is reflected in today's current specifications.



*The anniversary event was an opportunity for visitors to tour LTRC laboratories and participate in equipment demonstrations.*

## **2005-10**

- Concrete research showed that ternary mixtures with a supplementary cementing material (SCM) replacement level of 70% is reasonable for DOTD applications. The costs savings to the Department could exceed \$1 million per year, and the results have been implemented in the 2016 version of the standard specifications.
- Evaluation of submerged roads after Hurricane Katrina showed that the strength loss compared to non-submerged roads was equivalent to about 2 in. of asphalt structure. Cost estimates were developed showing that the repair costs neared \$50 million. The submerged roads program was developed using this data.
- Knowledge and information gained from a project modeling hurricane evacuation traffic, specifically contraflow operations, led to enhanced effectiveness of evacuation plans currently in use today.

## **2010-present**

- A summary report of HPC studies looking at strengths, beam sections, and implementation of HPC by the Department showed that implementation efforts have saved DOTD a conservative \$14,690,000.
- Mechanistic-Empirical Pavement Design Guide (MEPDG) implementation efforts are aiding DOTD design engineers in current design efforts, while other pavement research is looking into the impact of shale oil recovery operations in Louisiana by quantifying the damage using a variety of tools.
- Surface resistivity measures will save DOTD long-term maintenance costs by quantifying and specifying longer-service life concrete structures. Analysis of one project showed a cost savings to the Department of \$40,000 in 3 months. Annual cost savings are estimated to be in excess of \$1.5 million, and the newly revised standards and specifications include surface resistivity testing as a pay item.

# WORKFORCE DEVELOPMENT HIGHLIGHTS

## 1985-1990

- In support of higher education with Louisiana universities, the DOTD CO-OP Program began in the early 1990s and is intended to enhance the education process by providing opportunities for participants to explore their interest in transportation engineering through practical experience. Since its inception, over 150 students have participated in the program.

## **30 Years by the Numbers**

Final reports published: 500+

People attended TTEC classes: 33,449

TTEC classes offered: 2,240

Conferences hosted: 17

- LTRC released its first logo, establishing its marketing presence.

## 1990-2000

- In 1991, the Engineer Resource Development Program (ERDP) was established. This 32-week rotational program employs entry-level engineers that have their BS in engineering and FE certification, allowing them to have a comprehensive experience of all areas of DOTD engineering. Since its inception, over 95% of all engineer interns in the program have become full-time employees with DOTD. Approximately 90% have progressed in their careers and received certification as licensed PEs, with a large majority of those still with the Department in various engineering positions statewide.
- A certification and training program for laboratory personnel in the districts, the Materials Lab, and LTRC began as well as various course revisions in anticipation of the 1992 Standard Specifications book. A series of "Safe Operating Checklists" for maintenance mobile equipment that was supplemented by operator proficiency verifications forms to evaluation of equipment operator's skills was implemented. Research was begun to develop a proposal to upgrade workplace literacy skills in anticipation of the establishment of a statewide literacy program for DOTD.
- LTRC hosted its first official Louisiana Transportation Engineering Conference. The most recent conference, now known as the Louisiana Transportation Conference (LTC), was held in February 2016, attracted nearly 1,600 attendees/vendors, and featured 72 technical sessions, 8 professional development sessions, how-to clinics, and a myriad of alternative sessions dealing with various management and workplace issues.

## 2000-2005

- DOTD/LTRC hosted the 59th Annual Southeastern Association of State Highway and Transportation Officials (SASHTO) Conference in New Orleans. Over 1,000 delegates attended, including the chief administrative officers and top assistants from the DOTs.
- The LTRC website was updated to give the center the online presence it needed. In addition, 2004 marked the beginning of online event registration.
- PPM No. 59, Work Force Development, was created, which affected over 1,150 DOTD employees. After an extensive review, 49 structured training programs were revised and PPM No. 59 consolidated all existing policies governing structured training programs. under one directive.
- In 2004, LTRC began hosting seminar series, providing technical leadership through a forum that demonstrates new technologies, publicizes LTRC research, discusses problems, and imports the best practices of others and transportation partners.

# WORKFORCE DEVELOPMENT HIGHLIGHTS

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## **2005-2010**

- TTEC opened to the public and received Tier 2 Center designation. The additional LTRC facility is dedicated to the delivery of transportation training, professional development opportunities, continuing education, and technology transfer. The TTEC Center hosts approximately 10,000 individuals (state, local, federal, and industry) each year. In addition, approximately 1,000 individuals outside of the TTEC facility take part in these DOTD-specific programs annually.
- In 2006, LTRC became a Southeast Regional National Highway Institute (NHI) Center, serving as an important educational resource that offers NHI courses and other programs sponsored/offered by NHI. The program has had over 5,000 people participate in the various program activities.
- The LTRC Library at TTEC was established with the goal of supporting researchers at LTRC, DOTD, LSU, and other DOTs across the nation in their transportation-related research. The library coordinates access to ASTM Standards and AASHTO Standards and Manuals for all of DOTD staff, collects and maintains collection of core materials, and assists with research needs of LTRC and all of DOTD staff.
- In 2006, LTAP became a member of the state Strategic Highway Safety Plan (SHSP) Team and began the Local Road Safety Program. This level of involvement of an LTAP in state and local road safety was relatively unique nationally at the time and was the start of a strong partnership between DOTD and LTAP. LTAP efforts have included crash and road characteristic data analysis, technical assistance, training and project development for local road safety projects, as well as outreach and coordination with the locals. The partnership between DOTD and Louisiana LTAP has been cited as a model of collaboration and included in a number of national best practice studies and peer exchanges.

## **2010-2015**

- DOTD/LTRC welcomed over 1,270 southeast transportation officials and professionals to the Sheraton in New Orleans, during the annual SASHTO Conference. Section 33 staff designed the event logo and created all print and promotional items.
- In 2013, LTRC began hosting TRAC and RIDES workshops for area teachers. Since then, 132 teachers representing 56 schools have received RIDES training and materials, and 45 teachers representing 26 schools have received TRAC training and materials. The curriculum for both the TRAC and RIDES programs are aligned with the National Standards for Math and Science (STEM), 21st Century Skills, and Core Curriculum Standards for Math. Teachers receive reference guides, software and supplies, and two days of training conducted by National Board Certified Teachers provided by AASHTO.
- In 2012, the DOTD Leadership Development Institute began, which strives to develop leaders of the next generation in line with a positive culture and strategic agenda. Since 2014, a total of 160 classes have been held and 2,273 people have participated in the classes.

## **2015-Present**

- LTRC's YouTube page began actively producing high-quality videos, focusing on subjects and problems important to the Department and center alike. LTRC also began creating "Transportation Talk," a monthly short-video series from the Secretary's office, addressing current issues or new trends in regard to Louisiana highways and infrastructure.
- With the launch of the free LTRC app, users are able to instantly reference publications, class information, contact information, as well as view the center's most recent videos on LTRC's revamped YouTube channel.

# WORKFORCE DEVELOPMENT

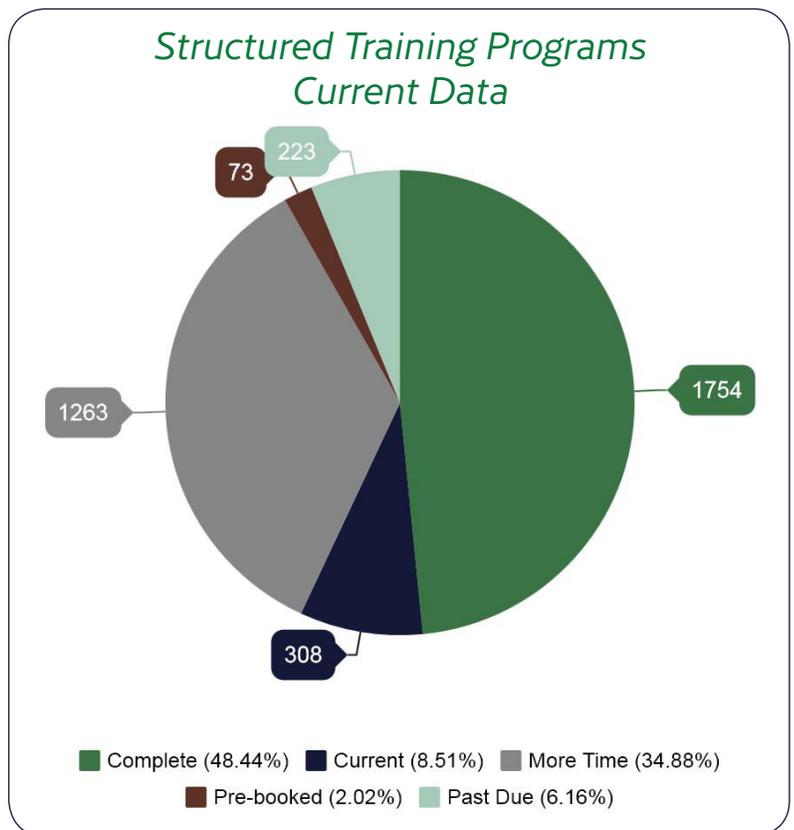
Training is a critical component of career advancement, and DOTD supports and promotes an environment of continual learning. This atmosphere allows employees to maximize their potential and provide qualified personnel crucial to the effective management of the transportation system. Through specialized and intensive job-specific training and education programs, LTRC reaches out to individuals working in the transportation industry.



Each year, the External Training Program hosts programmatic initiatives for over 10,000 individuals (state, local, federal, and industry) and is a progressive partnering effort between the public and private sectors of the transportation industry.

## DOTD Structured Training Unit

The DOTD Structured Training Program is a department-sanctioned, progressive training curriculum that requires specific work-related training be completed at each level of an employee's career path. DOTD supports and promotes an environment of continual learning and feels that training is a necessary component and an integral part of career advancement. Structured training can involve professional development, technical skills training, continuing education, hands-on and on-the-job training. The program manages the workforce development for personnel in construction, maintenance, and supervisory/leadership positions. The program also provides liaison assistance to headquarters personnel and district training personnel for policy interpretation and compliance decisions.

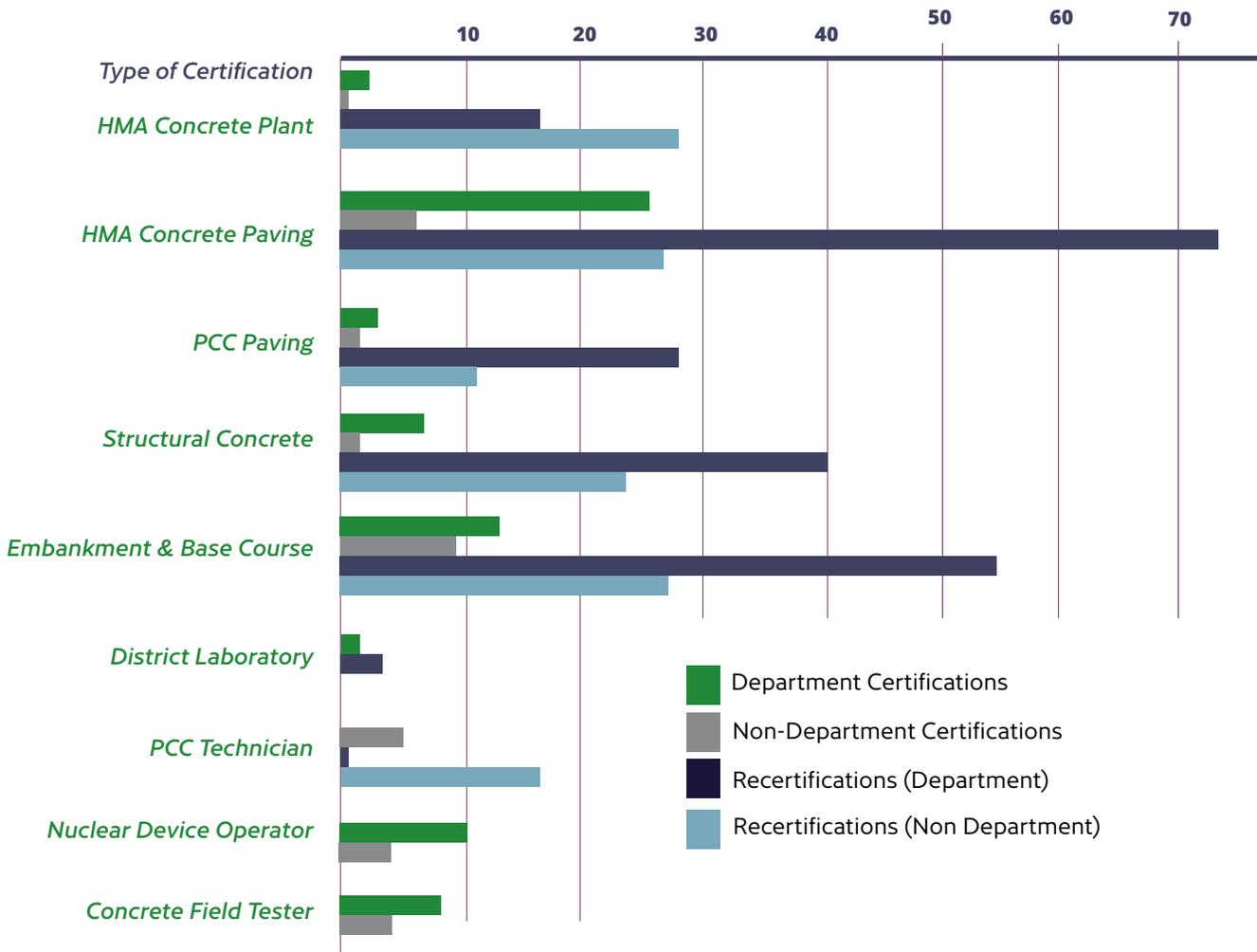


# WORKFORCE DEVELOPMENT

## Construction and Materials Training Program

The Construction and Materials Training Program manages the Inspector/Technician Certification Program for DOTD and the Louisiana transportation industry. This program develops construction and materials training and coordinates the training, testing, authorization, certification, and re-certification of inspectors and technicians on a statewide level in each area of construction.

- Awarded 110 new construction certifications – processed 352 re-certifications



## Presentations/Classes

- Basic Flagging Procedures
- Traffic Control Through Maintenance Work Areas
- 4 Superpave Mix Design and Analysis classes
- 3 Highway Plan Reading Volume I classes
- Highway Plan Reading Volume II
- 7 Project Management classes
- DOTD Aviation Workshop facilitation
- Structural Concrete Inspection class
- Embankment and Base Course Inspection
- Presentation Skills 101 Pilot class
- 2 Site Manager for LPA sessions

# WORKFORCE DEVELOPMENT

## Course Development

The Maintenance Training Program focuses on the development of new job-specific courses related to job functions, work processes and safe operation of equipment used by maintenance field personnel. These courses promote an awareness of safe practices and attitudes needed for maximum job performance. This training program also assists with the Equipment Operation Certification Program to standardize and improve equipment training for maintenance functions.

There were 10 courses/projects developed or revised during this time period. There are 27 projects current/on-going.

### **Construction Courses/Projects Completed**

- Construction Training Course/Projects Completed
- Introduction to Standard Specifications for Roads and Bridges course revision
- Revision of Application of Quality Assurance for Portland Cement Concrete and Structures
- Revision of Application of Quality Assurance for Asphaltic Concrete Mixtures
- Revision of Application of Quality Assurance for Embankment and Base Course

### **Maintenance Courses/Projects Completed**

- Duties of Personnel Assigned to Moveable Bridges and the Bridge Operator's Notebook revision

### **Other Projects Completed**

- Voiceover narration for:
  - PSA for Bicycle Safety
  - Roundabout Intersection
  - DOTD Substance Abuse WBT
  - Frontend Loader Maintenance
- Stress Management ILT course and manual completed.

### **Construction Current/On-Going Projects**

- Revision of Structural Concrete Inspection Volumes I and II manuals
- PCC Paving Inspection manual and supporting materials

- PCC Plant Inspection manual and supporting materials
- PCC Mix Design manual and supporting materials
- Profiler Authorization Program
- Numerous lab procedure instructional training videos
- Updating Specialty Area and Recertification tests
- Aggregate Tester Program
- Revision of Pre-Stressed Concrete Inspection course
- Creation of Structural Steel Welding Inspection course
- Management of the Inspector/Technician Certification Program for DOTD and the Louisiana Transportation Industry

### **Maintenance On-Going Projects**

- Equipment Operator Certification Program
- Basic Flagging Update
- Traffic Control through Maintenance Work Areas Update
- Dangerous Insects/Poisonous Plants Course
- IRF Videos and Supplements Update
- Practical Electricity Series 2 – 4
- Bearings: Preference and Preservation
- Planning, Scheduling, and Controlling Maintenance Resource Manual revision
- Maintenance Traffic Control Handbook revision

### **Other Projects On-Going**

- Conversion of grammar courses to web-based format
- Training Section Newsletter
- Road Design Manual training course
- Site Manager for LPA training
- Voice over narration is ongoing for
  - DOTD Audit Expectations
  - DOTD Interview Panel Member WBT
  - DOTD Biennial Meeting 2017-2019 WBT
- LTRC's Test.com E-Testing System management
- LEO and DTRN support and training

# WORKFORCE DEVELOPMENT

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## Management Development Training Program

This program oversees several mandatory supervisory, management development, and career development training programs: Management Development Training program, a structured training program for DOTD employees in a professional job series; the Engineering Technician Supervisory Training program, a supervisory training program for DOTD Engineering Technicians; and the Civil Service Supervisory training program for supervisors.

During Fiscal Year 2016-2017, courses for these training programs were delivered through several sources: the Civil Service Comprehensive Public Training Program (CPTP); the DOTD Human Resources Section; and in-house training courses developed by LTRC. There were 996 employees subscribed to the Management Development Program and 191 of them completed their course programs in FY 2016-2017. There were 471 employees subscribed to the Management Development Technician Program and 65 completed their programs this year. There were 886 employees in the CPTP Civil Service Supervisory Group Training Program; 241 of them completed their course programs in FY 2016-2017.

## Workforce Development Program

This program serves as liaison to LTRC Transportation Curriculum Council (TCC) as outlined in PPM 47 and collaborates specifically with district administrators and section heads to support staff development, training, and planning.

The purpose of the committee and related subcommittees is to advise and assist LTRC in the identification, prioritization, development, evaluation, and implementation of transportation related technology transfer, training, work development, and educational services for DOTD and its public and private transportation industry partners. New training and process and procedures are approved by the TCC before implementation. The Workforce Development program has the responsibility of helping to schedule and facilitate subcommittee meetings, distribute the meeting minutes to the appropriate people, and provide any support services needed by the subcommittee. The TCC held three meetings this fiscal year. The council is now coordinating the effort to seek out new training needs within the department and for industry.

## Headquarters Training Program

This program assists section heads and designated section training coordinators in providing their employees the training prescribed by the training programs governing their employees' positions. This program provided the following for the Headquarters sections:

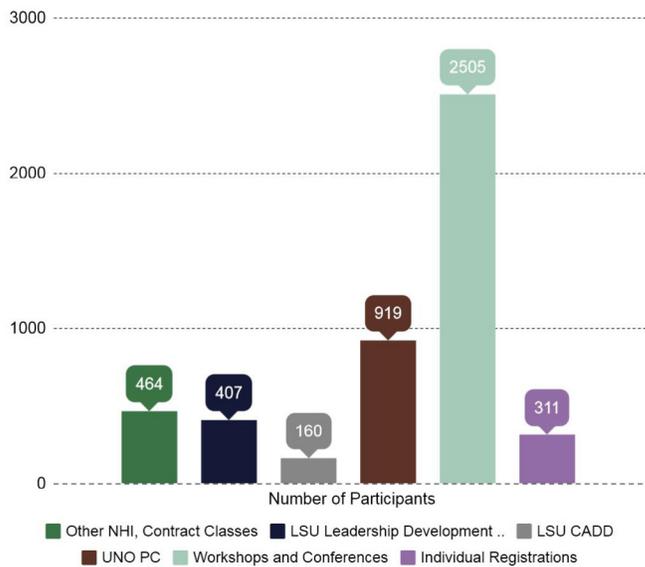
- Orientation – Monthly presentation at new employee orientation. This year provided 196 new employees information about respective training programs and how to fulfill individual training requirements.
- Exception reports – If an employee's training is incomplete at the time of a proposed personnel action, such as a merit increase or promotion, an exception may be allowed if it is the result of circumstances over which the employee has no control, such as scheduling or unavailability. Training records of nine employees were reviewed and exceptions granted this year.
- Testing – Testing sessions are held three times a month for self-study courses. Employees were given 183 tests for different courses this year.
- Training – This year classes were conducted to train employees in topics to include: Basic Flagging, Lockout/Tagout, Hand and Power Tool Safety, Poisonous Plants, Traffic Control through Maintenance Traffic Areas, Basic Flagging and Hazardous Communications, and various safety topics.

# WORKFORCE DEVELOPMENT

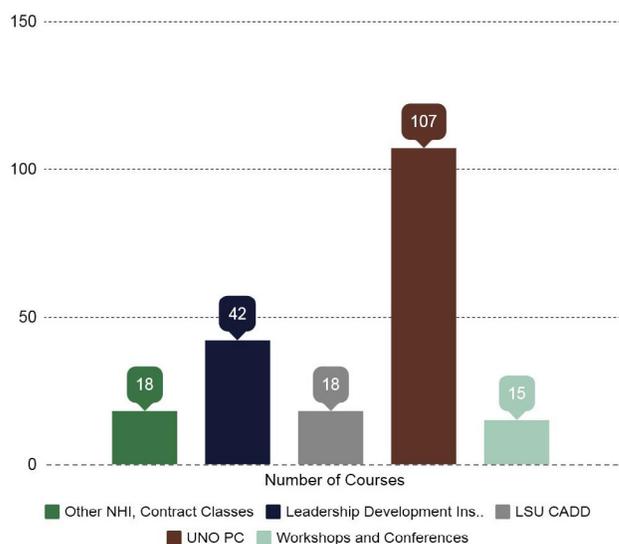
LTRC is committed to being a leader in workforce development. As LTRC's research section continues to focus on the future of transportation technology, the technology transfer and training section maintains its roots in the present—in making practical application of research's technological innovations and transferring them to the transportation community through aggressive implementation, training, and educational activities. Central to all of our training programs is the External Training Program, which is dedicated to the delivery of transportation training, professional development opportunities, continuing education, and technology transfer to engineers, technicians, and other professionals from DOTD and Louisiana's public and private sectors.

## Overview of Participation in External Training Program Activities

**Number of Participants**



**Number of Courses**



# WORKFORCE DEVELOPMENT

The following are brief overviews of External Training Program activities managed at LTRC:

## **National Highway Institute Program**

The National Highway Institute Program covers the 15 programmatic areas that are offered statewide to DOTD employees, municipal employees, private engineering firms, and other transportation partners. These areas include, but are not limited to, the following:

- Business, Public Administration and Quality
- Construction and Maintenance
- Design and Traffic Operations
- Environmental
- Freight and Transportation Logistics
- Geotechnical
- Highway Safety
- Hydraulics
- Intelligent Transportation Systems (ITS)
- Mathematical Sciences
- Pavement and Materials
- Public Affairs
- Real Estate
- Statewide Planning
- Structures

This program has various courses that are required in departmental structured training programs. A sample listing of these required courses are as follows, but not limited to: Bridget Inspection Refresher; Fracture Critical Inspection of Steel Bridges; Managing Highway Contract Claims; Safety Inspection of In-Service Bridges; and Writing Highway Construction Specifications. These courses address Louisiana-specific material while also incorporating the necessary federal guidelines as well. During this fiscal year, 478 participants attended 17 courses.

## **CADD/MicroStation Structured Training Program**

Through the DOTD CADD/MicroStation Structured Training Program, this has developed the Department's current process for obtaining surveying information that utilizes Microstation, Inroads, and Inroads Survey. This process of coding and capturing data continues to evolve as departmental and federal regulations change. Microstation and Inroads are the software backbones for the Department's plan development.

It is imperative that the Department identifies where trends are going and how newer software reacts to the current data collection processes. The Department is required to train and test new versions of the software to not only give guidance to DOTD staff but the consultants who work for the Department as well. DOTD is one of the few state departments that utilize this product series, and the only industry around that uses these products are the companies that work for DOTD.

## **Work Zone Safety Program**

Through the DOTD Work Zone Safety Program, the following Louisiana specific courses are required for departmental employees and any other non-departmental entity that will work on a departmental project: Louisiana Traffic Control Technician; Louisiana Traffic Control Supervisor; Louisiana Traffic Control Design Specialist; Louisiana Guardrail Installation Training; and Louisiana Nighttime Traffic Control.

Work Zone Safety classes are required for contractor, consultant, and DOTD personnel. This is to inform workers about safety procedures and improve worker knowledge in order to avoid injury during their daily employment activities. Through these efforts, this also enables highway workers to provide for the safety of motorists, workers, and pedestrians. In contract documents for the contractors and consultants, the verbiage specifically states they must have Louisiana-specific training as it relates to the MUTCD, and the DOTD Work Zone Safety Program provides this specific training through a contract with ATSSA, the only organization that offers this Louisiana-specific training. The contract for services contains language on the Louisiana Standard Specifications, the Special Provisions, the Supplemental Specifications, and the Louisiana Specific Traffic Control Details. Also within the contract, there are specific requirements and consequences for the contractor not having Louisiana specific training.

## **District Sign Specialists' Certification Program**

The DOTD District Sign Specialists' Certification Program plays a critical role in Traffic Operations. Not only must these employees perform manual labor and operate equipment, they must know, understand, and apply critical traffic engineering principles and details of sign

# WORKFORCE DEVELOPMENT

*continued from page 19*

installation as outlined in the Manual on Uniform Traffic Control Devices. In addition, District Sign Specialists are required to testify in court, and this ATSSA certification covers trial and deposition testimony.

## **Nuclear Gauge and Radiation Program**

The DOTD Nuclear Gauge and Radiation Program is a vital program that assists departmental employees' who are authorized to use a nuclear gauge for density testing on Louisiana's highway construction projects. It is one of the most important Quality Assurance tools an inspector has to ensure that the foundation of the road will perform as designed. The use of any device containing nuclear material requires compliance with the federal Nuclear Regulatory Commission regulations and safety precautions, enforced by the Louisiana Department of Environmental Quality and DOTD. To ensure that overexposure to radiation does not occur, DOTD monitors over 450 nuclear gauge operators with a dosimeter badge. DOTD is also concerned with the public's exposure to radiation from Department-owned nuclear gauges. To ensure the public is not exposed to more than 100 mrem/year, a biannual survey of the storage area(s) is completed by the District Radiation Safety Officer and submitted to the DOTD Materials Lab Radiation Safety Officer.

## **ArcGIS Program**

The DOTD ArcGIS Program is guided by Map 21 and is federal regulations based. These regulations and Map 21 are moving state transportation agencies into a GIS-based environment for asset management, performance management, inventory, and operations. Transportation-related GIS technologies rely on a linear referencing method to associate legacy data systems with GIS technologies. DOTD has GIS uses in almost all of its engineering and business sections.

## **PC/Microsoft Structured Training Program**

The DOTD PC/Microsoft Structured Training Program is strategically mapped to various employee category structured training programs. These courses are required for departmental engineers, engineering technicians, administrative staff, and support personnel. The course requirements vary by employee category. During this fiscal year, 872 participants attended 107 courses.

## **Other Programs**

All specialized Title 48 and Title 39 programs are managed via contract with various vendors through the External Programs. A small listing of the contracts that are directed through the DOTD External Programs is included here:

- **Fiber Optic-The Light Brigade for Fiber Optic Training-** This three-day course provided attendees with the skills necessary to use the latest fiber optic technology and equipment effectively. The first two days consisted of the Technician Level 1 on the physical layer: fiber optics theory, fiber type, cables, splicing, terminations, fiber management products, installation, testing, troubleshooting, maintenance, and safety. Day 3 consisted of the Design Technician Level 2 on system design, loss budgets, optical multiplexing, bidirectional transmission, bandwidth considerations, integration for voice, video, and data systems, and analog-to digital applications.
- **PTV Vision Traffic Suite (PTV America, Inc.)** - In our two-day Vistro Traffic Analysis course, students learned how to conduct traffic studies, evaluate development impacts, and optimize signals all with a single package. They worked with interactive examples of intersections corridors, networks, and development scenarios.

## **Leadership Development Program**

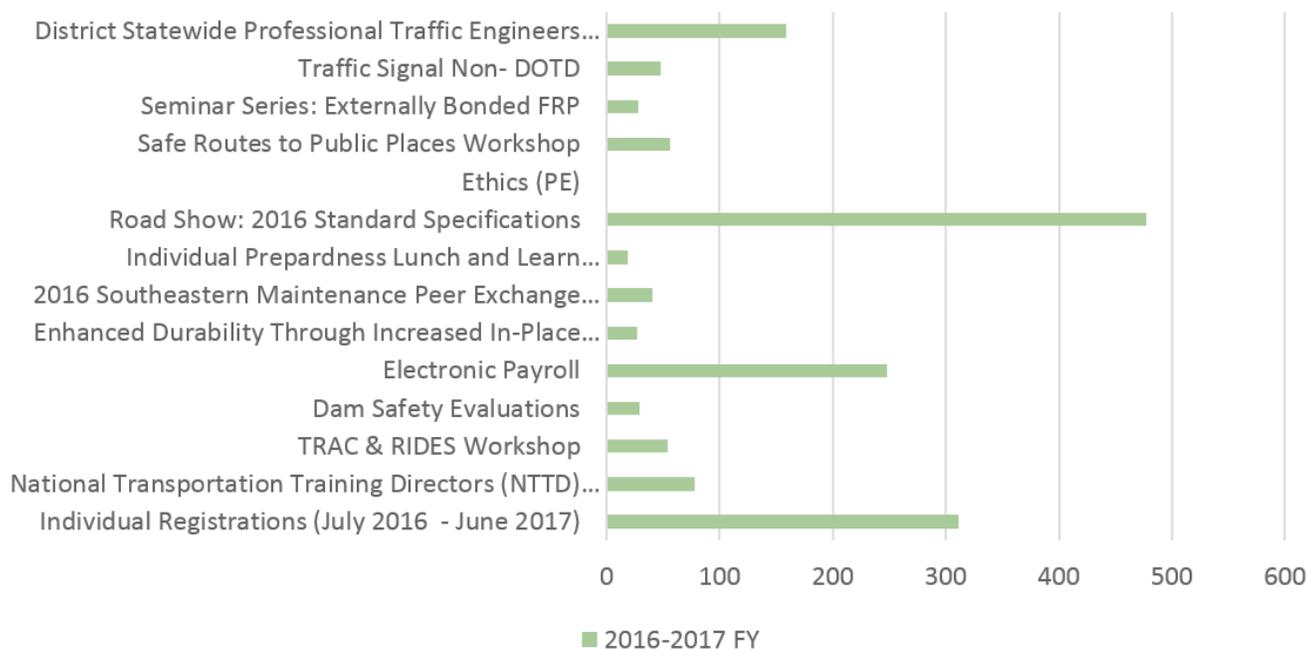
The Leadership Development Program (LDP) provides participants a process of continuous learning and the ability to apply the leadership methods discussed. In addition, the Leadership Development Program aims for everyone within the Department of Transportation and Development to adopt new behaviors and beliefs toward effective leadership and extend them to the highest levels of achievement.

The goal of this program is to introduce and promote competencies that will empower participants to recognize and improve their leadership skills. Emphasis will be on leadership competencies such as Excellence in Behavior, Communication, Relationships, Innovation, and Operational Agility. These competencies are essential to getting extraordinary things done in organizations. Leadership concepts and approaches are introduced throughout the courses. During this fiscal year, 407 people participated in 42 courses.

# WORKFORCE DEVELOPMENT

## Workshop and Seminar Attendance

### Workshop and Seminar Attendance



## Support for Higher Education

The DOTD CO-OP Program is a cooperative endeavor between DOTD and Louisiana universities, providing practical experience to civil, mechanical, environmental, electrical, industrial, and chemical engineering students through employment in public sector transportation engineering work. The DOTD CO-OP program is intended to enhance the educational process by providing opportunities for participants to explore their interest in transportation engineering through practical experience. The program also provides opportunities for DOTD to evaluate participants as potential employees. Undergraduate students (juniors or seniors) are employed year round in positions related to their major engineering field of study: civil, mechanical, environmental, electrical, industrial, biological, or chemical engineering. During the 2016-17 fiscal year, 40 students participated in the program.

DOTD also has an engineering training program for recent college graduates that that is managed and facilitated at LTRC, known as the Engineering Rotational Development Program (ERDP), which provides new engineers with an invaluable introduction to DOTD employment. The ERDP is a 30-week rotation program designed to offer entry-level engineers an opportunity to experience several engineering functional areas within the Department and provide a comprehensive view of the Department and its objectives prior to placement. After orientation at LTRC, new hires spend 1 to 3 weeks in 19 different sections. During the 2016-17 fiscal year, 21 people participated in the ERDP.

# LTAP

LTAP celebrated 30 years at LTRC by continuing its tradition of providing high quality training and technical assistance to its local customers as well as working in close partnership with DOTD on a number of issues involving and impacting local agencies. A variety of historically popular classes were delivered along a selection of updated and new offerings. LTAP also continued working in partnership with DOTD and FHWA on issues related to local transportation infrastructure management, safety and project delivery.

A variety of classes were delivered statewide to include: Road Safety 365, Local Bridge Maintenance, Basic Supervisory Skills, Unpaved and Gravel Roads Maintenance, Drainage and Chainsaw Safety. Numerous on-site workshops for temporary traffic control and work zone safety were also conducted nearly continuously throughout the year. Over 2,000 participants from nearly 200 different agencies and organizations took advantage of the LTAP training and workforce development program.

In partnership with DOTD and FHWA, LTAP delivered a series of LPA training classes for local agencies receiving federal aid funding for projects. The training schedule included a required Core Training Class, Management of the Project Delivery Process for the Responsible Charge and Construction Engineering and Inspection. Over 400 people have been trained since this program began four years ago, leading to a greater understanding of how to better manage these types of project. A joint FHWA/DOTD/LTAP effort, Local Stakeholder Partnering to Streamline Project Delivery is an initiative by LTAP which includes surveys, focus groups and data development in the effort to identify opportunities to improve and streamline the project delivery process for local projects. This initiative will continue in to 2018.

Local bridge management remains a challenge across the country and in Louisiana. LTAP provided liaison efforts between DOTD and the parish bridge owners through the Louisiana Parishes Engineers and Su-



*Steven C. Strength, PE, PTOE, teaches LTAP's Basics of Work Zone Safety with Basic Flagger Mini-workshop to Jefferson Parish employees.*

pervisors Association; the Police Jury Association of Louisiana and the other local bridge owners. The LTAP bridge training classes were updated to reflect all current regulatory deadlines as well as the process that is being followed by the Louisiana DOTD to collect and verify required information. New requirements being implement by DOTD will require another update to the Bridge Inspection class to be developed in 2018.

The Local Road Safety Program managed by LTAP in coordination with DOTD's Office of Safety completed the Road Safety Crash Data Profiles for each of the parishes on the list of the top 20 parishes for road deaths and crashes. Targeted training was conducted statewide on the data profiles. Agencies were taught how to use the information to create local road safety plans and to identify opportunities to apply for project funding through the DOTD Highway Safety Improvement Program (HSIP). LTAP's staff also participated in numerous regional and state safety coalition meetings to promote the Local Road Safety Program and provide technical assistance. The local agencies have responded by submitting more and better quality project applications for funding consideration and at least five parish level safety plans have been developed with the new information.



*Rip Tompkins (in orange helmet) demonstrates the purpose of his cutting procedures to a participants in Lake Charles.*

The Everyday Counts Cycle 4 (EDC4) managed by FHWA's national Office of Innovate Program Delivery (OIPD) hosted an EDC4 Summit in December which included a local focus and LTAP. Four of the initiatives chosen by the state for implementation are directly related to local transportation and LTAP is a member of the implementation teams and is working on efforts related to pedestrian safety (STEP); pavement preservation; data driven safety analysis; and community connections. Monthly meetings are held to plan upcoming events such as peer groups discussions, peer exchanges, and workshops. The local components are included in the state activities and in some cases separate implementation plans have been developed. The LPA Stakeholder Partnering initiative is also part of DOTD's EDC program.

The LTAP Director, Dr. Marie Walsh, serves on several NCHRP panels for national safety projects and is a member of the TRB ANB10 Transportation Safety Management Committee and serves as the Chair of the Towards Zero Death Subcommittee. Dr. Walsh represented NLTAPA at the AASHTO Standing Committee on Highway Traffic Safety and is a member of AASHTO's Towards Zero Death (TZD) Steering Committee. She presented the TZD Overview at the kickoff summit for the new Road to Zero initiative in Washington, DC in

October 2016. She was awarded the Louisiana WTS Outstanding Transportation Educator award in late 2016. Steve Strength, LTAP Program Manager, continued in his role as Region 6 representative to the National LTAP Association Executive Committee and also became the Chair of the NLTAPA Training Resources and Products Work Group. He also continues as Co-Chair of the Infrastructure Team of Louisiana Strategic Highway Safety Plan (SHSP.) The Louisiana LTAP was also an invited member of three national peer exchanges on local road safety data, safety circuit riders and HSIP project development. Courtney Dupre, Program Coordinator, is active with the Louisiana American Public Works Association and serves on its Board and also with the NLTAPA Communications Work Group.

The LRSP hired a Program Manager/LPA Program Manager in November of 2016, Leonard P. Marretta, who concentrates on promoting local road safety and implementing DOTD long range strategies for improving safety on Louisiana's local roads. LTAP has 1-2 student workers throughout the year; one student works closely with the LRSP and helps manipulate crash data, while the other helps with class material preparation and database maintenance.



*Peter Allain, LRSP Engineer, facilitates one of nine Regional Crash Data Workshops across the state.*

# TECH TRANSFER

## TRAC & RIDES Reach Area Classrooms



As a participating state of the TRAC™ (Transportation and Civil Engineering) and RIDES (Roadways In Developing Elementary Students) programs, Louisiana has been equipping teachers across the state for close to 5 years with resources for use in their science, math, and social science classrooms. Through these federally funded AASH-TO educational outreach programs, teachers are invited to LTRC every year for a two-day, hands-on learning event conducted by National Board Certified teachers. During the two days, teachers become the students as they are challenged with interactive activities and equipped with hundreds of lesson plans, a trunk of free supplies, and hours of activities and software that will captivate their students. “The TRAC Program has eight modules designed to engage students in solving real-world problems while connecting them to the working world of transportation. Students design bridges, build magnetic-levitation trains, plan a city, or learn about environmental issues that

impact transportation.,” explained Associate Director, Technology Transfer & Training Mary Leah Caillier Coco, Ph.D. “The RIDES Program is designed for K-8 students with a focus on math and science skills to help students utilize critical thinking skills and also learn about careers in transportation.”

Teachers who have attended TRAC or RIDES programs agree that this training is unlike any they have ever received. D.C. Reeves 3rd Grade Math and Science Teacher Amber Perrin explained, “I have bragged to my colleagues each time I have an opportunity by letting them know that this was the best workshop I have attended in my 13 years of teaching.” One of the goals of TRAC and RIDES is to introduce these interactive activities to students at an early age to foster an interest in STEM areas, in hopes that students would be inspired to consider careers in transportation and civil engineering.

Teachers who frequently use the provided lessons and activities agree that TRAC and RIDES is accomplishing that and more inside their classrooms. “Using the program in my classroom has helped to spark an interest of STEM within my students,” said Shenandoah Elementary Kindergarten Teacher Erica Clements, M. Ed. “My students’ vocabulary has grown greatly. They are able to make meaning through their experiences and apply it to other learning.” As a participant in TRAC and RIDES, teachers also have access to LTRC, where they can request local engineers to visit classrooms to serve as speakers, teach a hands-on activity, and/or talk to students about the importance of math and science in preparing for their future.



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To download LTRC Mobile, search “LTRC” in the App Store (iPhone) or Google Play Store (Android)

### Video Productions for Fiscal Year 16-17

- Move Over PSA
- Round-a-Bout PSA
- Don’t Stop on the Tracks PSA
- Be a Roll Model PSA (edited)
- DOTD Sign Shop
- Road Anatomy
- Flood Slideshow (edited)
- Destination Zero Deaths (edited)
- Gramercy Overpass Time Laps
- Transportation Talk (6 episodes)
- Task Force Initiative- Motion graphic presentation

## Publications

LTRC's Publications and Digital Media Development Program meets DOTD's informational and training needs through newsletters, brochures, annual reports, capsules, web development, and video production/photography. During 2016-2017, LTRC published 15 final reports and technical summaries, 19 project capsules, 1 technical assistance report, and 4 Technology Today newsletters. In addition to in-house publications, LTRC research was featured in 59 journal articles and in 113 presentations at professional conferences and meetings throughout the world.

### **Project Capsules Published**

- 17-2GT: Update the Pile Design by CPT Software to Incorporate Newly Developed Pile-CPT Methods and Other Design Features
- 17-1GT: Verification and Implementation of Set-up Empirical Models in Pile Design
- 16-1GT: Geotechnical Design Manual
- 17-5SS: Development of Guidelines for Ramp Metering Implementation and Performance Evaluation on I-12
- 17-4SS: Dredging LA's Navigable Waterways: a Statewide Systematic Approach to Meeting Dredging Needs
- 17-1C: Effect of Clay Content on Alkali-Carbonate Reactive (ACR) Dolomitic Limestone
- 17-1SA: Evaluating the Effectiveness of Regulatory and Warning Signs on Driver Behavior near Highway/Rail Crossings
- 16-5SA: Highway Work Zone Construction Safety Research and Training: A Driving Simulator Study
- 17-1P: Improving the Use of Crack Sealing to Asphalt Pavement in Louisiana
- 17-2P: Implementation of a Localized Roughness Specification for Use on Louisiana Bridges
- 17-3P: A Decision-Making Tool for Incorporating Sustainability Measures into Pavement Design
- 16-2P: Transportation Infrastructure Asset Damage Cost Recovery Correlated with Shale Oil/Gas Recovery Operations in Louisiana
- 16-5P: Pavement Service Life Extension Due to Asphalt Surface Treatment Interlayer
- 16-1SA: Highway Construction Work Zone Safety Performance and Improvement in Louisiana
- 16-4SA: Pedestrians and Bicyclists Count: Developing a Statewide Multimodal Count Program
- 16-1C: Radio Frequency Identification (RFID) Tagging for Material Tracking and Future Asset Management
- 16-1ST: Retrofit of Existing Statewide Louisiana Safety Walk Bridge Barrier Railing Systems
- 16-3ST: Live Load Rating of Cast-In-Place Concrete Box Culverts in Louisiana
- 16-4ST: Over Height Impact Avoidance and Incident Detection System

### **Reports Published**

- 384 | 03-4ST: Strengthening of Bridge Beams using Fiber Reinforced Polymers (FRP)
- 530 | 13-1SA: Distracted Driving and Associated Crash Risks
- 562 | 11-2GT: Field Instrumentation and Testing to Study Set-up Phenomenon of Piles Driven into Louisiana Clayey Soils
- 566 | 12-1SS: Traffic Counting Using Existing Video Detection Cameras
- 567 | 10-5ST: Development of Guidelines for Transportation of Long Prestressed Concrete Girders
- 568 | 15-1ST: Development of Wave and Surge Atlas for the Design and Protection of Coastal Bridges in South Louisiana – Phase 2
- 569 | 12-4C: Evaluation of Portland Cement Concrete with Internal Curing Capabilities
- 570 | 14-1SS: Development of Optimal Ramp Metering Control Strategy for I-12
- 571 | 15-3SS: Investigation into Legislative Action Needed to Accommodate the Future Safe Operation of Autonomous Vehicles in the State of Louisiana
- 572 | 14-2SA: Factors Influencing Seatbelt Utilization in Louisiana and Strategies to Improve Usage Rate
- 573 | 13-2C: Laboratory Evaluation of 100 Percent Fly Ash Cementitious Systems
- 574 | 12-2P: Building Accurate Historic and Future Climate MEPDG Input Files for Louisiana DOTD
- 575 | 15-2GT: Lime Utilization in the Laboratory, Field, and Design of Pavement Layers
- 576 | 14-1SA: Drugged Driving in Louisiana: Quantification of its Impact on Public Health and Implications for Legislation, Enforcement, and Prosecution
- 578 | 12-7P: Roller Compacted Concrete over Soil Cement under Accelerated Loading
- Technical Assistance Report 16-03TA-C: Evaluation of Cores from Jefferson Highway Near Airline Highway

# PROFESSIONAL MEMBERSHIPS

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## Transportation Research Board (TRB) Affiliations

- ABG30, Technology Transfer
- ABG20, Transportation Education and Training
- B0002(1), Transportation Research Thesaurus Subcommittee
- ABG40, Library and Information Science for Transportation
- AFF80, Structural Fiber Reinforced Plastics
- AFF30, Concrete Bridges
- AFS70, Geosynthetics
- AFP30, Soil and Rock Properties
- AFS70, Committee on Geosynthetics
- AFS 60, Subsurface Drainage
- AFS10, Transportation Earthworks
- AFS30, Foundations of Bridges and Other Structures (Committee Communications Coordinator)
- AFD60, Flexible Pavement Design Committee
- AFP60, Engineering Behavior of Unsaturated Geomaterials
- AFD80, Pavement Structure Modeling and Evaluation
- AFP50, Seasonal Climatic Effects on Transportation Infrastructure
- AFD90, TRB Pavement Surface Properties and Vehicle Interaction
- AFN40, Concrete Materials and Placement Techniques
- AFK10, Critical Issues and Emerging Technologies in Asphalt
- AFK20, Asphalt Binders
- AFK30, Non-Binder Components of Asphalt Mixtures
- AFK40, Surface Requirements of Asphalt Mixtures
- AFK50, Structural Requirements of Asphalt Mixtures
- AFN30, Durability of Concrete
- AFN10, Basic Research and Emerging Technologies Related to Concrete
- AFN20, Properties of Concrete
- AFN40, Concrete Materials and Placement Techniques
- Subcommittee on Transport of Energy Products
- Subcommittee on Behavioral Processes: Qualitative and Quantitative Methods
- Roadside Safety Committee

## American Society of Civil Engineers (ASCE) Affiliations

- Structural Wind Effects
- Engineering Mechanics Institute, Properties of Materials
- Engineering Mechanics, Modeling Inelasticity Multi-scale Behavior
- Engineering Mechanics, Nanomechanics and Micro-mechanics
- Engineering Mechanics, Structural Health Monitoring & Control Committee
- Engineering Mechanics, Dynamics Committee
- Engineering Mechanics, Fluid Dynamics Committee
- *Journal of Engineering Mechanics*, Associate Editor

## American Concrete Institute (ACI) Affiliations

- 335, Composite and Hybrid Structures, Associate Member
- 423, Prestressed Concrete
- 239, Ultra High Performance Concrete
- 239C, Structural Design on Ultra High Performance Concrete
- 123, Research and Current Developments
- 440, Fiber Reinforced Polymer Reinforcement
- 444, Structural Health Monitoring and Instrumentation

## National Cooperative Highway Research Program (NCHRP) Affiliations

- 18-17, Entrained Air Void System for Durable Highway Concrete
- 15-62, Access Management and Design Guidelines for Truck Routes
- 20-102(07), Implications of Automation for Motor Vehicle Codes
- 20-102(09), Providing Support to the Introduction of CV/AV Impacts into Regional Transportation Planning and Modeling Tools

# PROFESSIONAL MEMBERSHIPS

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- 46-05, Use of Recycled Asphalt Pavement and Shingles
- 8-02, Tack Coat Specifications, Materials, and Construction Practices
- NCHRP 20-07/Task 340 – National Training: Challenges and Opportunities

## American Society for Testing and Materials (ASTM) Affiliations

- D04.20, Empirical Tests of Bituminous Mixtures
- D04.22, Effect of Water & Other Elements on Bituminous Coated Aggregates
- D04.24, Bituminous Surface Treatments
- D04.25, Analysis of Bituminous Mixtures
- D04.26, Fundamental/Mechanistic Tests
- D04.44, Rheological Tests
- D04.45, Specifications for Modified Asphalt
- D04.46, Durability & Distillation Tests

## Other Memberships

- Southeast Task Force on Technician Training and Qualification
- LATOD – Louisiana State Workers Trainers Group
- National Transportation Training Directors
- Society of Human Resource Management
- ITI Technical College, Construction Management Curriculum Council
- AASHTO TRAC and RIDES Advisory Board
- AASHTO Transportation Curriculum Coordination Council
- Southeast Task Force for Technician Training and Qualification (SETFTTQ)
- Special Libraries Association (SLA), Transportation Division Member
- Eastern Transportation Knowledge Network Member (ETKN)
- Engineering Geology and Site Characterization Committee, Geo-Institute
- Engineering Geosynthetics Committee, Geo-Institute

- Engineering Deep Foundation Committee, Geo-Institute
- US Universities Council on Geotechnical Engineering Research (USUCGER)
- Deep Foundation Institute, DFI
- Louisiana Engineering Society
- National Society of Professional Engineers
- CAAL Technical Committee
- AASHTO Research Advisory Committee
- FHWA Expert Task Group RO2 – Implementation of Precast Concrete Pavement Technology
- Gulf Region Intelligent Transportation Society (GRITS)
- Partnership for the Transformation of Traffic Safety Culture
- Strategic Highway Safety Plan (SHSP) Occupant Protection Emphasis Area Team (Co-chair)
- AASHTO Standing Committee on Highway Traffic Safety (SCOHTS)
- LA Strategic Highway Safety Plan Implementation Team
- Traffic Records Coordinating Council (TRCC)
- Communications Coordinating Council (Team leader)
- Public Relations Association of LA, Baton Rouge Chapter
- LSU Public Administration Institute Student Association
- Voluntary Protection Programs Participants' Association
- Association of Asphalt Paving Technologists (AAPT)
- Chi Epsilon, Civil Engineering Department Level Honor Society
- Tau Beta Pi, College of Engineering Level Honor Society
- Phi Kappa Phi, University Level Honor Society

# LTRC STAFF

## Office of the Director

Sam Cooper, Jr., Ph.D., P.E., Director  
Sheri Hughes, Executive Services Assistant

### External Programs

Vijaya (V.J.) Gopu, Ph.D., P.E., Associate Director

## Research & Development

Tyson Rupnow, Ph.D., P.E., Associate Director  
Bridget LeBlanc, Executive Services Assistant  
Theresa Rankin, Business Office Manager  
Tina Blanchard, Business Office Accountant

### Pavement and Geotechnical Research

Zhongjie "Doc" Zhang, Ph.D., P.E.,  
Pavement & Geotechnical Research Administrator

#### *Pavement Research*

Kevin Gaspard, P.E., Senior Pavement Research Engineer  
Mark Martinez, P.E., Pavement Research Manager  
Mitchell Terrell, Engineering Technician DCL  
Shawn Elisar, Engineering Technician 4  
Terrell Gorham, Engineer Technician 5

#### *Pavement Research Facility - ALF*

Zhong Wu, Ph.D., P.E., Associate Professor - Research,  
Accelerated Pavement Research Program Manager  
Keith Gillespie, Pavement Research Specialist 3  
Xiahui Sun, Research Associate 4  
Alphonse Vallery, Research Specialist

#### *Geotechnical Research*

Gavin Gautreau, P.E., Senior Geotechnical Research  
Engineer  
Khalil Hanifa, E.I., Geotechnical Research Engineer Intern  
Ural "Renee" Cosse, Engineering Technician DCL  
Hend Alyousef, Engineering Technician 4  
Preston Causey, Engineering Technician 4

#### *Geotechnical Engineering Research Laboratory*

Murad Abu-Farsakh, Ph.D., P.E., Professor, Research,  
GERL Manager  
Qiming Chen, Ph.D., Research Associate 4  
Milad Saghebfar, Ph.D., Research Associate 4  
Adele Lee, Computer Analyst 2  
Md. Nafiul Haque, Ph.D., Postdoctoral Researcher

### Materials Research

Samuel B. Cooper, III, Ph.D., P.E., Materials Research  
Administrator

#### *Asphalt Research*

David Mata, Engineer Intern 2  
Saman Salari, Engineer Intern 2  
Kristi Goetting, Engineering Technician 5  
Jeremy Icenogle, Engineering Technician DCL

#### *Concrete Research*

Zachary Collier, Engineer Intern 2  
Norris Rosser, Engineering Technician DCL  
Leon Goudeau, Engineering Technician 4  
Austin Gueho, Engineering Technician 2

#### *Engineering Materials Characterization Research Facility*

Louay Mohammad, Ph.D., Professor, EMCRF Manager  
Minkyum Kim, Ph.D., Research Associate 5  
Wei Cao, Ph.D., Research Associate 5  
Tae Sun You, Research Associate 5  
Eugene Laphand, Lab Tech

#### *Structures Research*

Walid Alaywan, Ph.D., P.E., Senior Structures Research  
Engineer

### Special Studies

Kirk M. Zeringue, P.E., Senior Special Studies Research  
Administrator

#### *Planning/Intermodal*

Chester Wilmot, Ph.D., Professor  
Ravindra Gudishala, Ph.D., P.E., Research Associate 5

#### *ITS & Traffic Research*

Julius A. Codjoe, Ph.D., ITS/Traffic Research Associate 5

#### *Louisiana Center for Transportation Safety*

Dortha Cummins, Director  
Rudynah E. Capone, Safety Initiatives Manager  
Elisabeta Mitran, Ph.D., Research & Technical Assistance  
Manager  
Ashley M. Smithers, Research & Administrative Assistant

## Technology Transfer & Training

Mary Leah Coco, Ph.D., Associate Director, Technology Transfer & Training  
Paul Hendricks, Computer Manager

### **Technology Transfer**

Michael Boudreaux, P.E., Technology Transfer Engineer

### **Publications & Digital Media Development**

Jenny Speights, Public Information Director  
Jenny Gilbert, Technical Writer  
Emily Wolfe, Multi-Media Specialist  
Chris Melton, Photographer/Videographer

### **Structured Training Programs**

Cindy Twiner, DOTD Structured Training Director  
Ted Ball, Management Development Program Manager  
Rex Ransome, Headquarters Training Program Manager  
Candy Cardwell, Workforce Development Planning Officer  
John Dean, Construction and Materials Training Program Manager  
Keith Beard, District Training Liaison/PCC/Structural Training  
Patrick Frazier, Asphalt Concrete Training  
Kelvin Stone, Maintenance Training Program Manager  
Richard W. Black, DOTD Program Specialist 3  
Amy Christen, Teaching Associate  
Susan Nichols, Training Records Program Manager

### **External Educational Resources**

Angela Rovaris, DOTD External Training Director  
Allison Landry, NHI/Individual Registration/Special Event Program Manager  
Melissa Lee, Microsoft/CADD/Special Training Program Manager  
Rebecca Rizzutto, Education Outreach Program Coordinator  
Garrett Wheat, Teaching Associate, DOTD Leadership Development Institute  
Sandy Brady, Librarian  
Brenda Wolfe, Administrative Assistant  
Patrick Mehaffey, Audio Visual Manager

### **Local Technical Assistance Program**

Marie Walsh, Ph.D., Director, LTAP  
Bob Breaux, LTAP Office Manager  
Steve Strength, LTAP Program Manager  
Courtney Dupre, Training Program Coordinator  
Leonard P. Marretta, LRSP & LPA Program Manager  
Peter Frost, Training Program Assistant

# LTRC Policy Committee

Janice Williams, P.E.  
Chief Engineer, DOTD

Sam Cooper, Ph.D., P.E.  
Director, LTRC (ex-officio)

Norma Jean Mattei, Ph.D., P.E.  
Civil Engineering Chairman  
University of New Orleans

Katherine Raymond, Ph.D.  
School of Science & Engineering  
Tulane University

Eric Kalivoda, Ph.D., P.E.  
Assistant Secretary, Planning and Programming  
DOTD

Kirk Gallien, P.E.  
Deputy Assistant Secretary of Operations  
DOTD

Nazimuddin "Wasi" Wasiuddin, Ph.D., P.E.  
Assistant Professor of Civil Engineering  
Louisiana Tech University

George Voyiadjis, Ph.D.  
Associate Professor  
Louisiana State University

Ken McManis, Ph.D., P.E.  
Professor and Head of Department of Civil Engineering  
University of Louisiana at Lafayette

Dimitris Dermisis, Ph.D., P.E.  
Assistant Professor, Department of Civil Engineering  
McNeese State University

Joshua A. Joseph, Jr., Ph.D.  
Chair, Department of Civil & Environmental Engineering  
Southern University

Brandon Buckner, Observer  
Federal Highway Administration