



Tran-SET

ISSUE 2 | SPRING 2018

TRANSPORTATION CONSORTIUM OF SOUTH CENTRAL STATES (TRAN-SET)

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About Tran-SET:

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late-November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes."

Letter from the Director

Welcome to Tran-SET!

As spring arrives, it's astonishing to see how much Tran-SET has grown since our last newsletter (Winter 2017). In January, we held our Mid-Year Meeting with our Associate and Program Directors. As a group, we reflected upon Tran-SET's strengths, weaknesses, opportunities, and threats (SWOTs) and identified areas for continued advancement. Our first-year research projects, awarded in May 2017, are beginning to show promising preliminary results. This spurred us to create updated fact sheets, or *Project Highlights*, for all of our 33 ongoing projects. Please visit our **website** to view the *Project Highlights* and learn more about each project's progress.

We will be holding our inaugural Tran-SET Conference April 3–4 in New Orleans, LA. The conference will feature lectern sessions over each of our 33 ongoing projects, a student poster competition, special invited speakers, and be held in conjunction with our Annual Business Meeting with our associate directors, program directors, and center advisory board. **And it is not too late to register or attend!** Please join us to learn more about Tran-SET, meet our staff and researchers, and ways to collaborate and/or otherwise utilize our research! Please visit our **website** for more information and to register.

In the upcoming weeks, we will be awarding our second-year research projects – which includes 37 additional projects, \$581k in external matching funds, 12 private and public partnerships, and will support over 65 students. More information is included in this newsletter.



Tran-SET is also beginning efforts to better coordinate, engage, and involve other research centers in our current and upcoming efforts. This will include hosting a joint webinar series. Please "stay tuned"; more information will be forthcoming.

I invite you to read through our Spring 2018 newsletter and learn more about our current efforts and outreach activities. Please do not hesitate to contact us if you have any questions, comments, or suggestions. Thank you. **Enjoy!**

Marwa Hassan, PhD, PE, LEED AP BD+C, M.ASCE
CETF Distinguished Professor; Graduate Coordinator
College of Engineering, Louisiana State University



THE TRAN-SET TEAM

Our Associate Directors

Tran-SET's leadership team consists of ten associate directors that help coordinate our research (their main role), technology transfer, educational, and workforce development activities **among their respective institutions**.



Charles Berryman, PhD
Professor, Department Chair
Construction Management
Louisiana State University



Ibrahim Karaman, PhD
Professor, Department Head
Materials Science & Engineering
Texas A&M University



Stefan Romanoschi, PhD
Professor
Civil Engineering
University of Texas at Arlington



Susan Bogus Halter, PhD
Professor
Civil Engineering
University of New Mexico



Samir Ahmed, PhD
Professor
Civil & Environmental Engineering
Oklahoma State University



Zahid Hossain, PhD
Associate Professor
Civil Engineering
Arkansas State University



Zraghava Kommalapati, PhD
Professor
Civil & Environmental Engineering
Prairie View A&M University



Craig Newtonson, PhD
Professor
Civil Engineering
New Mexico State University



Timothy Dykes
Program Manager, Instructor
Construction Management
Baton Rouge Community College



Samer Dessouky, PhD
Associate Professor
Civil & Environmental Engineering
University of Texas at San Antonio



Gholam Ehteshami, PhD
Professor, Department Chair
Engineering, Mathematics, & Technology
Navajo Technical University

Our Program Directors

Tran-SET's leadership team also involves program directors that guide and shape Tran-SET's **activities as a whole**. They showcase remarkable leadership abilities and experiences through involvement in national efforts and committees.



Mostafa Elseifi, PhD
Professor
Civil & Environmental Engineering
Louisiana State University



Louay Mohammad, PhD
Professor
Civil & Environmental Engineering
Louisiana State University



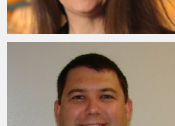
Anand Puppala, PhD
Professor, Associate Dean
Civil Engineering
University of Texas at Arlington



Mahmoud Reda Taha, PhD
Professor, Department Chair
Civil Engineering
University of New Mexico



Paola Bandini, PhD
Associate Professor
Civil Engineering
University of New Mexico



Tyson Rupnow, PhD
Associate Director
Louisiana Transportation Research Center



Sam Cooper, Jr., PhD
Director
Louisiana Transportation Research Center

Our Program Coordinators

Tran-SET program coordinators work directly with the director, associate directors, program directors, researchers, and others to successfully execute the Center's efforts.



Christofer Harper, PhD
Research & Technology Transfer Coordinator
Assistant Professor
Construction Management
Louisiana State University

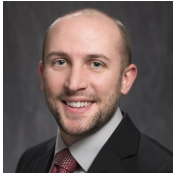


Chao Wang, PhD
Educational & Workforce Development Coordinator
Assistant Professor
Construction Management
Louisiana State University

THE TRAN-SET TEAM

Our Staff

Of course, nothing would be possible without our dedicated staff!



Christopher Melson
Program Manager
Construction Management
Louisiana State University



Rebecca Harris
Business Manager
Construction Management
Louisiana State University



Jose Milla, PhD
Research Associate
Construction Management
Louisiana State University



Gabriel Arce, PhD
Research Associate
Construction Management
Louisiana State University

OUR IDENTITY

Our Vision

Address the accelerated deterioration of the transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovation construction management processes.

Our Mission

Conduct all phases of research, technology transfer, workforce development, and outreach activities as to solve transportation challenges in Region 6 and support implementation.

Our Research Themes

- *Enhancing Durability and Service Life of Infrastructure*
- *Preserving the Existing Transportation System*
- *Preserving the Environment*
- *Addressing other Region 6 Transportation Needs*

SECOND-YEAR RESEARCH PROJECTS

Key Facts

37 FUNDED
PROJECTS

\$4.5 MILLION
TOTAL FUNDING

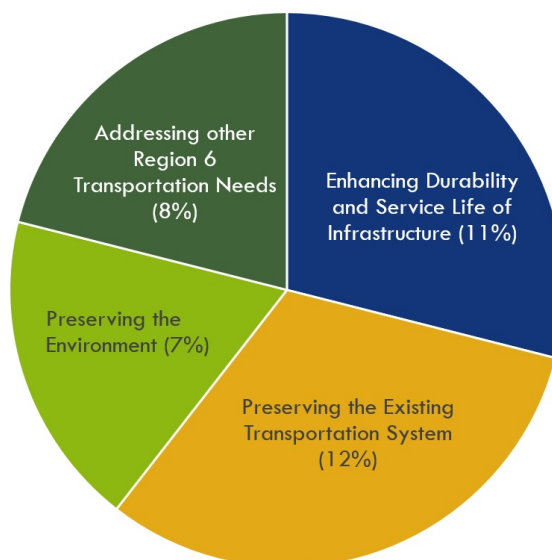
\$0.6 MILLION
EXTERNAL FUNDS

12 PRIVATE AND PUBLIC
PARTNERSHIPS (TO DATE)

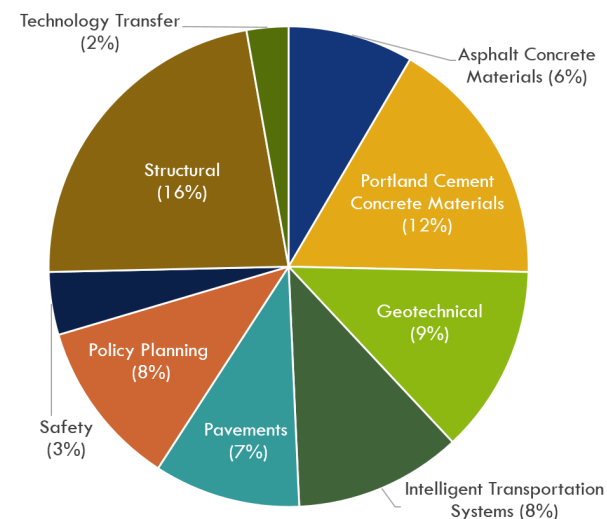
8 MULTI INSTITUTION
RESEARCH PROJECTS

65 STUDENTS
SUPPORTED (EST.)

Tran-SET's second-year project proposals were collected in December 2017, reviewed by independent experts in academia, industry, and the public sector at the end of February 2018, and are currently being revised based upon those reviews. Tran-SET is expecting to award 37 research projects by early April 2018, totaling over \$4.5 million (with matching funds/in-kind services). The following graph shows the selected projects categorized by research theme:



The second-year projects can be further categorized by research area, exhibiting the breadth of the Center, ranging from materials research to Intelligent Transportation Systems (ITS).



Tran-SET places great emphasis on the implementation of research - requiring all projects to have at least 10% of funding allocated to a six-month implementation phase, after the 12-month technical research phase (typically). Please visit our [website](#) as more information becomes available.

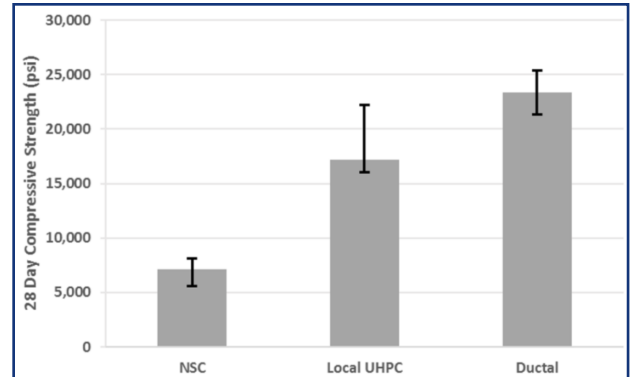
RESEARCH IN PROGRESS: HIGHLIGHTS

Please see below for a showcase of select, current research. Is our research applicable to your technical area? Beneficial or a potential solution to your local transportation system? Can benefit from your efforts? Interesting? Please contact us for ways to coordinate, be involved, and engaged! To learn more about the following projects, please visit our **website**.

Bridge Deck Overlays Using Ultra-High Performance Concrete

Dr. Craig Newton, Dr. Brad Weldon - New Mexico State University

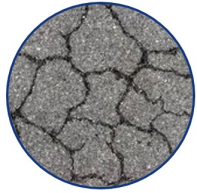
Overlays are placed on existing concrete bridge decks for several reasons, including increasing cover for the deck reinforcing steel, improving ride ability, and improving skid resistance. Typical concrete overlay materials include latex-modified concrete, low slump dense concrete, and polyester polymer concrete. However, each of these materials have drawbacks that have led designers to question their cost effectiveness. The goal of this study is to develop overlay technologies that can increase the service life of the overlay and underlying concrete deck using ultra-high performance concrete (UHPC) produced with local materials. Using UHPC as an overlay material has potential advantages over other materials, namely its high strength and exceptional durability. Effectiveness of an overlay material and the existing concrete deck, shrinkage, and cracking properties of the overlay material and substrate materials.



Typical compressive strengths of normal strength concrete, UHPC produced with local materials, and Ductal (a pre-packaged, proprietary UHPC mixture)

enced by surface roughness at the UHPC and NSC interface.

Slant shear and split cylinder specimens that consist of one-half UHPC and one-half NSC substrate material are used to measure the bond strength. Laboratory tests measuring the workability and shrinkage of the UHPC design mix were also conducted. Based on the preliminary results of this study, UHPC appears to have the potential to be used as an overlay material as long as it has proper workability and the substrate surface is adequately prepared.



Enhancing durability and service life of infrastructure



Split cylinder sample for compression test

Therefore, to assess the potential of UHPC as an overlay material, this study focuses on the strength bond between the UHPC and the normal strength concrete (NSC) substrate, which is greatly influ-

Recruiting, Retaining, and Promoting for Careers at Transportation Agencies

*Dr. Christofer Harper - Louisiana State University; Dr. Susan Bogus - University of New Mexico
Dr. Raghava Kommalapati, Dr. Doeun Choe - Prairie View A&M University*

Challenges exist in today's workforce in terms of recruiting and retaining quality employees as well as attracting minority and underrepresented groups. Also, smart, ambitious, and motivated employees are difficult to find and keep in technical positions, such as DOT engineers, engineering technicians, and maintenance personnel. In order to manage the dynamics of meeting today's and future needs of transportation construction and maintenance, state DOTs need robust workforce management strategies and guidance that can attract, train, retain, and promote critical positions in the transportation field.

This study will provide solutions for workforce development strategies while acknowledging the limitations and barriers commonly seen at state

DOTs (e.g., limited budgets and the inability to offer higher salaries than private firms).

The objectives of this study are to: (1) determine the best practices employed by transportation agencies, other public agencies and organizations, and private firms that lead to recruitment of qualified employees, (2) assess current best practices for retaining qualified and experienced employees, (3) identify potential institutional barriers that exist within transportation agencies that limit the recruitment and retention of high quality employees, and (4) develop outreach, educational, and workforce development hands-on activities to expose, and engage bright young minds from underrepresented groups to broader fields of transportation and associated careers.



Addressing other Region 6 Transportation Needs

RESEARCH IN PROGRESS: HIGHLIGHTS



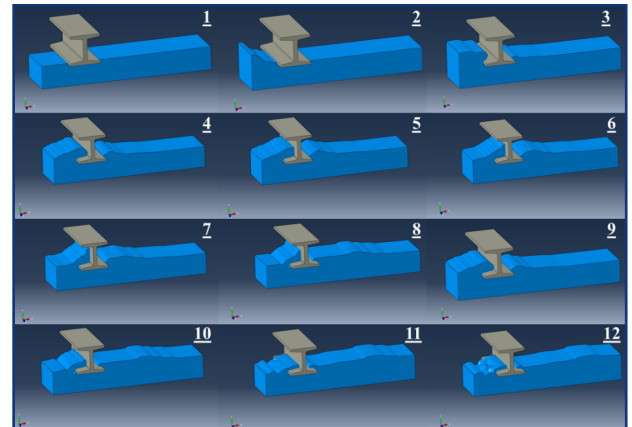
Preserving Existing Transportation Systems

Coastal Bridges under Hurricane Stresses along the Texas and Louisiana Coast

Dr. Adolfo Matamoros, Dr. Firat Testik - University of Texas at San Antonio

The societal cost of natural disasters can be significantly decreased through planning for resilience instead of accepting risk and repairing the damage. A recent study indicated the cost of repairing and replacing bridges damaged during Hurricane Katrina exceeded \$1 billion; however, a review of the damage reports showed that this cost could have been significantly reduced by implementing relatively simple mitigation measures. The most severe damage consisted of superstructure collapse due to unseating of the deck, which was induced by the combined actions of storm surge and hydrodynamic forces from waves. Studies that document damage from major hurricanes are an invaluable source of information; however, there is a need to develop scientific models capable of simulating fluid-structure interaction under the combined actions of storm surge and waves, so that the risk can be quantified through a scientific rather than empirical approach.

The main objective of this study is to develop a high-resolution model capable of simulating the response of bridge structure to hydrodynamic



Modeling of a wave impacting a bridge girder

loads for hurricane design conditions (i.e., surge height, wave height, and frequency) expected in the Texas-Louisiana coast. The model will be calibrated using historical data from past hurricanes such as Katrina and used to evaluate the vulnerability bridge structures on the Texas-Louisiana coast. The implementation phase will consist of developing a guide for engineering professionals illustrating regions of greatest hazard and bridge support details most vulnerable to failure during large storms.



Addressing other Region 6 Transportation Needs

Sustainable and Equitable Financing for Pedestrian Infrastructure Maintenance

Dr. Gregory Rowangould, Dr. Alexis Corning-Padilla - University of New Mexico

Many cities across the country place the responsibility of maintaining sidewalks on adjacent property owners. This maintenance and financial model raises several issues: (1) requiring individual property owners to inspect their sidewalks and contract out their repair is difficult to enforce and introduces inconsistency across the system, (2) paying for sidewalk maintenance may not be possible for lower income households, and (3) members of lower income households are also more likely to make trips by walking, and therefore, are disproportionately impacted by relatively high sidewalk repair costs and poor sidewalk conditions. Using Albuquerque, New Mexico as a case study, this project investigates alternative means of paying for pedestrian infrastructure repairs that provide a sustainable

A sample of sidewalks extending from randomly selected intersections in 50 randomly selected neighborhoods in Albuquerque were surveyed for holes, cracks, and slab displacement that might hinder sidewalk use. Each defect was recorded in a GIS database, and the research team is conducting a spatial analysis to evaluate the distribution of sidewalk maintenance costs across Albuquerque that will inform the financial modeling and equity analysis. The research team will then evaluate the sustainability and equity of several alternative funding models. These include incrementing the local portion of the gasoline excise tax, increasing property taxes, and increasing sales tax – and comparing these to a “business as usual” property owner model. The ability of each funding mechanism to provide adequate funding and its resulting tax burden will be evaluated across differing socioeconomic communities. While the project focuses on Albuquerque, the study results are expected to be useful for cities across the country.



Typical sidewalk defects in Albuquerque, NM

source of revenue and more equitable outcomes.

RESEARCH IN PROGRESS: HIGHLIGHTS



Preserving the Environment

Development of Environmentally Friendly Stabilization Methods for Transport Infrastructure Based on Geopolymers

Dr. Miladin Radovic - Texas A&M University; Dr. Anand Puppala - University of Texas at Arlington

Texas and its neighboring states have a prevalence of expansive clays, which are thought to be the primary cause of pavement distresses. Expansive clays undergo volume change due to variations in its moisture content: an increase in moisture causes the clay to swell (resulting in heaves on pavement), while a decrease results in shrinkage (in soil and pavement cracking). These repetitive cycles of shrinking and swelling impose stresses to the infrastructure.

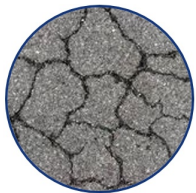


Paris, TX site with longitudinal shrinkage cracks

demands high energy and generates substantial amount of CO₂.

The use of Geopolymers has received much attention as an eco-friendly and sustainable alternative to conventional chemical additives, since they can be processed at room temperatures from aqueous solutions of waste materials (e.g. fly ash) or abundant natural sources (e.g. clay). The aim of this study is to develop an innovative, sustainable, and eco-friendly solution (using Geopolymers) for stabilizing bases and subgrade foundations – using natural and waste materials that are abundant in the southwest United States. The effects of Geopolymer composition, dosage rates, curing time and temperature on overall properties of Geopolymer stabilized base and subgrade materials are studied to optimize the use of Geopolymers derived from local waste and natural materials. Both material characterization studies related to micro and macro behavioral changes are evaluated.

Conventionally, the swell-shrink potential of expansive clays is mitigated with the mixing of chemical additives, such as different polymers, lime and ordinary Portland cements. While chemical stabilization methods are used extensively, they are highly prone to leaching and durability issues, which make them inept as long-term solutions. Furthermore, the production of additives



Enhancing durability and service life of infrastructure

Enhancing the Durability and the Service Life of Asphalt Pavements through Innovative Light-Induced Self-Healing Materials

Dr. Marwa Hassan - Louisiana State University

Utilization of recycled asphalt materials, such as recycled asphalt shingles (RAS) and reclaimed asphalt pavement (RAP), is a cost-effective approach to reduce the use of virgin material consumption and negative environmental impacts associated with paving construction. Yet, the challenge of oxidation and brittleness of the recycled binder is significant. Age hardening of asphalt pavements, not only leads to the appearance of micro-cracks, but also eventually leads to pavement failure. Self-healing agents were recently proposed to enhance the self-healing capabilities of asphalt binder; self-healing properties are defined as the recovery of original asphalt properties, repairing the damaged area by closing the cracks, stopping crack propagation, and eventually enhancing the performance of asphalt pavement

An innovative smart self-healing agent, which is being evaluated in this study, is Ultra-Violet (UV) activated self-healing polymer. This new class of polymer can enhance elastic recovery of the binder and increase the self-repairing ability of

the polymer. The appearance of micro-cracks because of aging and excessive loading would cause the chemical breakage of polymer bonds and consequently produce “free radicals”. The produced “free radicals” would recombine through UV light exposure and close the micro-cracks. Based on this mechanism, it is expected that the new self-healing polymer can be useful in reducing the cost of maintenance and repair of asphalt pavements.

Specifically, this study aims to: (1) develop an optimized synthesis procedure for the production of UV light induced self-healing polymers, (2) examine the thermal stability of the produced polymer during asphalt pavement mixing processes, (3) evaluate the effect of self-healing polymer on the rheological properties of the binder, (4) evaluate the effect of self-healing polymer on the mix mechanical properties, and (5) evaluate the effect of UV light induced polymer on self-healing capabilities of asphalt mixture.

EDUCATIONAL & WORKFORCE DEVELOPMENT ACTIVITIES

Tran-SET aims to promote educational and workforce development in the transportation field through training and continuous education - and has a firm commitment to improve existing transportation-related programs at our 11 university partners. This is especially true for our **six minority serving institutions**; we are integrating diversity-related initiatives into our educational and workforce development activities to increase the number of underrepresented students in transportation programs. This is partially accomplished by coordinating and leveraging results of our research; it is anticipated that our currently funded projects will lead to: over 25 new or revised courses, over 40 new educational modules, over 25 seminars, over 15 webinars being developed/presented, and **supports over 90 students**.

Please see below for a showcase of select, educational and workforce development activities sponsored by or involving Tran-SET. Please stay up-to-date with our activities by liking us on Facebook, following us on Twitter, and visiting our **website**!



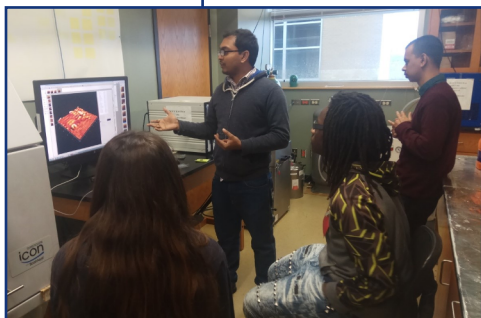
Tran-SET Researchers Host High School STEM Internship

Dr. Zahid Hossain, Tran-SET Associate Director, hosted students from the Jonesboro High School (JHS) STEM Academy during a two-day internship at his materials laboratory. The students were introduced to the civil engineering field, transportation profession, material characterization, Dr. Hossain's current research, and laboratory equipment (such as the Optical Contact Angle Analyzer and Atomic Force Microscope). The interns also met with the Dean of the College of Engineering, Director of Civil Engineering, and current civil engineering students at Arizona State University.



Dr. Hossain educating STEM students on structural joints

Dr. Hossain worked directly with the JHS STEM Academy principal and teachers to organize the event and select the interns. Certificates of attendance were given to the students, and certificates of appreciation were received by Dr. Hossain and his graduate students.



Graduate student presenting research to STEM students



Tran-SET Helps ASCE Student Chapter with Concrete Canoe

Gabriel Arce, Tran-SET Research Associate, and doctoral student, **Noorvand Hassan**, aided the Louisiana State University student chapter with their concrete mix design for the ASCE Concrete Canoe Competition. The mix design was based on the methodology and composition developed in Tran-SET's **"Evaluation of the Performance and Cost-Effectiveness of Engineered Cementitious Composites (ECC) Produced from Region 6 Local Materials"** project.

Dr. Arce and the students began working on the mix design in November 2017 and casted the canoe in late February 2018. This provided a great opportunity to educate the students on the properties, benefits, and mixing process required of ECC materials. The regional ASCE Concrete Canoe Competition will be held in Lafayette, LA on March 23rd, 2018.



ASCE students casting the fiber reinforced concrete to form their canoe

EDUCATIONAL & WORKFORCE DEVELOPMENT ACTIVITIES



Tran-SET Helps Establish Louisiana Chapter of Simulation and Capacity Analysis Users Group (SimCap)

In late February, **Christopher Melson**, Program Manager of Tran-SET, co-founded the Louisiana chapter of Simulation and Capacity Analysis Users Group (SimCap). SimCap is a volunteer network of professionals (working across geographic and organizational boundaries) with the aim to share information/experiences and to support, promote, and improve best practices in the application of traffic simulation and capacity analysis. SimCap comprises of seven chapters across the United States – and one chapter in Toronto, Canada.

Mr. Melson co-organized and presented at SimCap Louisiana's inaugural meeting on February 28th, 2018. Mr. Melson is also involved in Sim-

Cap's international leadership team – and presented on SimCap's mission, structure, history, and activities. The meeting discussed the chapter's identity (purpose, mission, goals, and objectives) and began defining the chapter's organizational structure. Approximately 20 professionals attended – including those from local, state, and federal government, academia, and consulting.

SimCap Louisiana is currently establishing its steering committee, a LinkedIn Group, and planning its upcoming meetings. Please contact Mr. Melson (cmelson1@lsu.edu) or Dr. Stephen Mensah (stephen.mensah@stantec.com) for more information.



Al-Basha Named UTC "Outstanding Student of the Year"

Ahmed Al-Basha, a master's student in civil engineering from New Mexico State University, was named a University Transportation Center "Outstanding Student of the Year". He received his award at the Council of University Transportation Centers' (CUTC's) 2018 Awards Banquet. Recipients of the award showcase exceptional technical merit, research capability, academic performance, and leadership. The Banquet was held in Washington, DC at the 2018 Transportation Research Board (TRB) Annual Meeting.

Mr. Al-Basha has played a critical role in Tran-SET's "Bridge Deck Overlays Using Ultra-High Performance Concrete" project: training new graduate students, leading the literature review, and helping initiate testing. His research interests include concrete materials, bridge engineering, bridge preservation, and sustainability. His thesis is entitled, "Durability of Concrete Cladded with Locally Produced UHPC Cured at Elevated Temperatures". Congratulations Mr. Al-Basha!



Tran-SET Participates in AGC Convention

Tran-SET enjoyed participating in and networking at the 99th Annual Associated General Contractors of America (AGC) Convention held on February 26th–28th, 2018 in New Orleans, LA. **Jose Milla** and **Gabriel Arce** (Tran-SET Research Associates) as well as **Noorvand Hassan**, **Max Aguirre**, and **Sharareh Shirzad** (graduate students sponsored by Tran-SET) were all in attendance to promote Tran-SET and to answer project-related questions.

The purpose of the convention was to "seize the opportunity to cultivate new ideas and partners, see and hear about the latest in construction innovation, and leave with the tools to accelerate your business to the next level." AGC comprises of 94 chapters, and over 26,000 construction firms. For more information please see AGC's **website**.



Research associates and graduate students in front of Tran-SET's booth at the 99th Annual Associated General Contractors of America (AGC) Convention

EDUCATIONAL & WORKFORCE DEVELOPMENT ACTIVITIES



Tran-SET Presents and Participates in Young Member Panel at Deep South ITE Meeting

Christopher Melson, Program Manager of Tran-SET, presented at the 2018 Deep South ITE (DSITE) Winter Meeting held in New Orleans, LA during March 8th–9th, 2018. Mr. Melson introduced members of DSITE to Tran-SET, providing an overview of the Center and highlighting two on-going research projects: **“Evaluation of the Performance and Cost-Effectiveness of Engineered Cementitious Composites (ECC) Produced from Region 6 Local Materials”** and **“Development of a Self-Powered Structural Health Monitoring System for Transportation Infrastructure”**. **Sogand Karbalaieali**, a doctoral student from Louisiana State University, also presented. Ms. Karbalaieali is involved in Tran-SET’s **“Improving the Performance of the Transportation System through Supply- and Demand-Oriented Traffic Mitigation Strategies”** project. Approximately 50 transportation practitioners, students, and faculty members were in attendance.

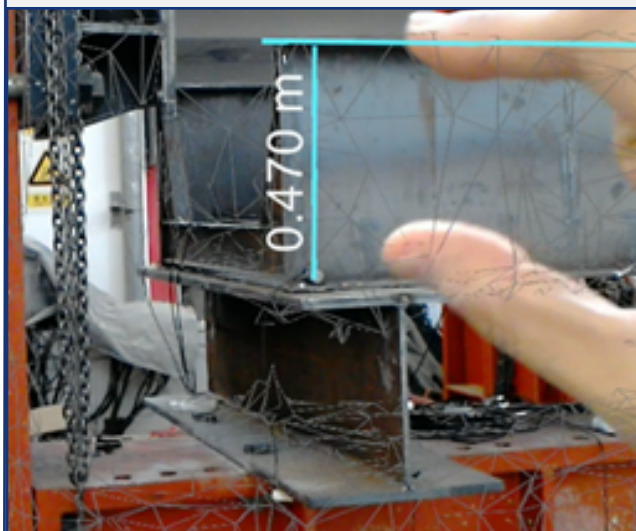


Mr. Melson also participated in DSITE’s young member panel – which aimed to increase participation and engagement of young members in transportation professional societies. DSITE comprises the states of Louisiana and Mississippi and is a section of the Southern District ITE. For more information regarding DSITE, please visit their [website](#).



Tran-SET Researchers Visit the Chinese Earthquake Administration (CEA) and Institute of Engineering Mechanics (IEM)

Dr. Fernando Moreu, Principal Investigator of Tran-SET’s **“Development, Training, Education, and Implementation of Low-cost Sensing Technologies for Bridge Structural Health Monitoring”** project, visited the Chinese Earthquake Administration (CEA) and Institute of Engineering Mechanics (IEM) in Beijing, China.

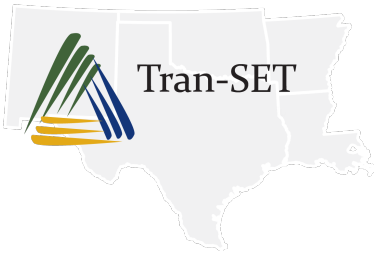


AR measurement of structural changes in a 1:5 scale bridge experiment at CEA

The research team was hosted by Dr. Wang Tao, Director of the CEA Laboratory, during November and December 2017. The facility is the largest dynamic laboratory in China for large-scale structural testing.

The visit was part of continued testing and development of augmented reality (AR) in the context of transportation infrastructure inspection – including inspection after a critical damage event. The testing included the first large-scale experiment to investigate the ability of AR in quantifying bridge damage after a disaster. Through AR, a user will be able to access information about a structure in an intuitive manner on-site with less effort and greater accuracy than traditional inspection means. Through AR, the inspector will be able to measure distances and areas (and eventually volumes) without contacting the infrastructure. Preliminary results of the testing were presented at the 2018 Transportation Research Board (TRB) Annual Meeting – and are currently being prepared for journal publication.

UPCOMING EVENTS



2018 Tran-SET Conference

- April 3-4, 2018
- New Orleans, LA
- Please visit our **website** to register and for more information.



2018 International Congress on Polymers in Concrete (ICPIC)

- April 29-May 1, 2018
- Washington, DC
- For more information, please visit: icpic2018.unm.edu



2018 CUTC Summer Meeting

- June 4-6, 2018
- Minneapolis, MN
- For more information, please visit:
www.cts.umn.edu/events/2018/CUTCmeeting



2018 World Transport Convention

- June 18-21, 2018
- Beijing, China
- For more information, please visit: www.wtc-conference.com

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