



A LOOK BACK:
2006 - 2014

Eight Years in Review

MISSOURI
S&T

CENTER FOR TRANSPORTATION INFRASTRUCTURE AND SAFETY

transportation.mst.edu



Message from the Director

Dear Colleagues,

It is with great pride that I present the following summary of the accomplishments achieved under U.S. DOT grant DTRT06-G-0014. This grant was awarded in April of 2006 and ended in June 2014. Throughout its eight years of operation as a national University Transportation Center, the Center for Transportation Infrastructure and Safety (CTIS) has become a Center of Excellence in the theme areas of advanced materials, transition-state fuel vehicle infrastructure and nondestructive testing technologies and structural health monitoring. The CTIS has provided faculty, staff and students with the means for establishing key relationships with transportation-oriented state and federal agencies, industry partners and other partnering universities. With CTIS leverage, the research and development projects carried out under this grant have created a critical mass and track record necessary to establish a Center of Excellence.

In addition to contributing to successful and relevant R&D projects, with the development of significant educational resources and by facilitating the transfer of advanced technology developed within the Center's theme areas, the CTIS has impacted the quality of available education for engineers and transportation professionals, equipping engineers with interdisciplinary skills, best practice guidelines and field experience. As a result of the CTIS activities, new interdisciplinary academic programs have been created at Missouri S&T under the umbrella of the Center for Infrastructure Engineering Studies (CIES). The University continued to be the provider of the Local Technical Assistance Program (LTAP) for the state of Missouri with the support of the CTIS.

Since its inception, the CTIS has performed work in accordance with its strategic plan to accomplish projected goals in the areas of education, research and technology transfer. The CTIS has put forth significant efforts to become highly visible and credible with the aim to recruit and retain quality students, faculty and professionals and to make significant contributions to transportation-related fields. As we look back over the eight years of operation, I believe the goals set forth in the strategic plan have been fully executed, due to the hard-work and dedication of the research team funded through the Center.

- Dr. Kamal H. Khayat, Director, CTIS

Points of Pride

FACULTY AND DEPARTMENTS RESEARCH TEAM

Geological Sciences & Engr.

Anderson, Neil L.
Maerz, Norbert H.

Chemical & Biochemical Engr.

Park, Joontaek

Chemistry

Leventis, Nicholas
Shi, Honglan

Civil, Architect. & Environ. Engr.

Bate, Bate
Chen, Genda
Elgawady, Mohammed
Feys, Dimitri
Gopalaratnam, Vellore S.
Khayat, Kamal H.
Loehr, J. E.
Luna, Ronaldo
Myers, John J.
Orton, Sarah L.
Prakash, Shamsher
Richardson, David N.
Rosenblad, Brent L.

Schonberg, William P.

Sneed, Lesley Haynes
Thiagarajan, Ganesh
Volz, Jeff

Wang, Jianmin
Washer, Glenn A.

Computer Science

Cheng, Maggie
Hurson, Alireza

Electrical & Computer Engr.

Donnell, Kristen
Ghasr, M. Tayeb
Pommerenke, David
Sedigh, Sahra
Wu, Cheng Hsiao
Wunsch II, Donald C
Xiao, Hai
Zheng, Y. Rosa
Zoughi, Reza

Women's Leadership Institute

Elmore, Cecilia Ann

Engr. Mngt. & Systems Engr.

Campbell, James F.
Gosavi, Abhijit
Konur, Dincer
Long, Suzanna
Qin, Ruwen
Smith, Brian Keith

LTAP

Pickerill, Heath A.

Mathematics & Statistics

He, Xiaoming

Mechanical & Aerospace Engr.

Birman, Victor
Chandrashekhara, K.
Hutcheson, Ryan
Kinzel, Edward
Koylu, Umit
Sheffield, John William

Mining and Nuclear Engr.

Ge, Mao Chen

Points of Pride

MAJOR INITIATIVES

MODOT STRUCTURES RESEARCH PROGRAM

ABDELDJELIL "DJ" BELARBI PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

GENDA CHEN, PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

VELLOR S. GOPALARATNAM, PH.D., P.E.

Civil and Environmental Engineering, University of Missouri-Columbia

OH-SUNG KWON, PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

JOHN J. MYERS, PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

SARAH ORTON, PH.D., P.E.

Civil and Environmental Engineering, University of Missouri-Columbia

LESLEY SNEED, PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

GANESH THIAGARAJAN, PH.D., P.E.

School of Computing and Engineering, University of Missouri - Kansas City

GLENN WASHER, PH.D., P.E.

Civil and Environmental Engineering, University of Missouri-Columbia

The MoDOT Structures Research Program consisted of six projects, addressing the state and national needs for cost-effective constructions of new bridges and for cost-effective maintenances of existing bridges. The Program was divided into the following projects with final reports delivered for each project.

- Project 1a: Structural Steel Coatings for Corrosion Mitigation
- Project 1b: Spalling Solution of Precast-Prestressed Bridge Deck Panels
- Project 2a: Reliability-Based Evaluation of Bridge Components for Consistent Safety Margins
- Project 2b: Coated-Steel Rebar for Enhanced Concrete-Steel Bond Strength and Corrosion Resistance
- Project 2c: Alternative and Cost Effective Bridge Approach Slabs
- Project 2d: Calibration of Load and Resistance Factors in LRFD Foundation Design Specifications

Points of Pride

MAJOR INITIATIVES

MODOT TRANSPORTATION GEOTECHNICAL RESEARCH PROGRAM

J. ERIK LOEHR, PH.D., P.E.

Civil and Environmental Engineering, University of Missouri-Columbia

JOHN J. BOWDERS, PH.D., P.E.

Civil and Environmental Engineering, University of Missouri-Columbia

LOUIS GE, PH.D.

Civil, Architectural, and Environmental Engineering, Missouri S&T

WILLIAM J. LIKOS, PH.D.

Civil and Environmental Engineering, University of Missouri-Columbia

RONALDO LUNA, PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

NORBERT MAERZ, PH.D., P.E.

Geological Sciences and Engineering, Missouri S&T

RICHARD W. STEPHENSON, PH.D., P.E.

Civil, Architectural, and Environmental Engineering, Missouri S&T

Guidelines developed under this program were part of a comprehensive research program undertaken by the Missouri Department of Transportation (MoDOT) to reduce costs associated with design and construction of bridge foundations while maintaining appropriate levels of safety for the traveling public. The guidelines were established from a combination of existing MoDOT Engineering Policy Guide (EPG) documents, from the 4th Edition of the AASHTO LRFD Bridge Design Specifications with 2009 Interim Revisions, and from results of the research program. Some provisions of the guidelines represent substantial changes to current practice to reflect advancements made possible from results of the research program. Some provisions reflect rational starting points based on judgment and past experience from which further improvements can be based.

Points of Pride

MAJOR INITIATIVES

MODOT PAVEMENT PRESERVATION RESEARCH PROGRAM



DAVID RICHARDSON, Ph.D., P.E., Missouri S&T

NEIL ANDERSON, Ph.D., P.E., Missouri S&T

JOHN BOWDERS, Ph.D., P.E., Univ. of MO-Columbia

ANDREW BOECKMANN, P.E., Univ. of MO-Columbia

RONALDO LUNA, Ph.D., P.E., Missouri S&T

MICHAEL LUSHER, Missouri S&T

BRENT ROSENBLAD, Ph.D., P.E., Univ. of MO-Columbia

LESLEY SNEED, Ph.D., P.E., Missouri S&T

To achieve the goal of reducing maintenance costs and improving minor road ratings, MoDOT embarked upon a plan of formalizing its maintenance/preservation planning. To assist in developing the plan, MoDOT contracted with the Missouri S&T and University of Missouri-Columbia researchers. The product of this research will become a part of MoDOT's overall Pavement Management System. The overall objective of the research was to provide a process that would allow MoDOT to do more selective planning, better engineering and more effective maintenance to minimize costs while maintaining adequate safety and performance of Missouri's pavements. The resulting Guidance Documents will act as guidelines for MoDOT's Pavement Specialists and Engineers.

Points of Pride

BY THE NUMBERS

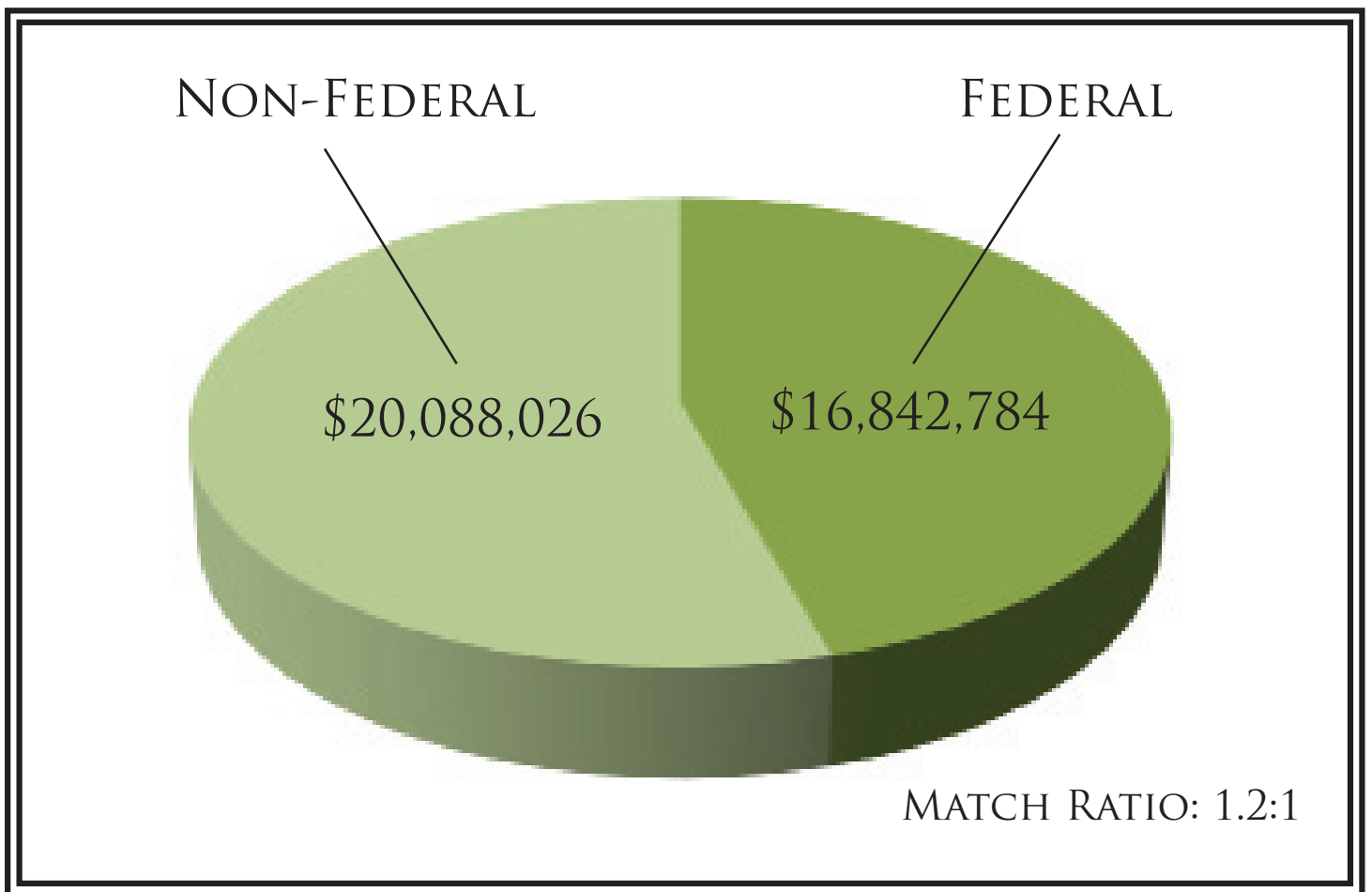
PERFORMANCE METRICS

Number of transportation-related courses taught	632
Undergraduate	322
Graduate	310
Number of students participating in transportation research projects	1748
Undergraduate	1324
Graduate	424
Number of transportation-related advanced degree programs	10
Master's Degree Programs	5
Doctoral Degree Programs	5
Numbers of Students Enrolled	428
Number of Students Receiving Degrees	100
Research projects awarded by Center	174
Basic research projects	82
Advanced research project	11
Applied research project	81
Total budgeted costs for those projects	\$17,110,400
Number of reports issued that resulted from transportation research projects funded by the UTC grant.	206
Number of transportation research papers presented at academic/professional meetings that resulted from projects funded by the UTC grant.	441
Number of transportation seminars, symposia, distance learning classes, etc., conducted for practicing professionals	953
Number of transportation professionals participating in those events	29,422

Points of Pride

FEDERAL (UTC) VS. NON-FEDERAL (MATCH)

FUNDING EXPENDITURES



Points of Pride

COLLABORATORS

1. American Mechanical and Aerospace Engineers - MSC Software and Dassault Systems
2. Arkansas State Highway and Transportation Department
3. AT&T Minority Scholarships
4. Boeing Scholarships
5. California Department of Transportation
6. Concrete Reinforcing Steel Institute
7. Electrical Power Research Institute
8. Ford Scholarships
9. Fuller, Mossberger, Scott & May Engrg.
10. FYFE Company
11. Gas Technology Institute
12. GeoEngineers Inc.
13. Ghent University, Belgium
14. Halliburton Scholarships
15. Icelandic Road Association
16. Iowa State University
17. Knight Hawk Engineering
18. Leica Geosystems Advantage
19. Missouri Department of Transportation
20. National Cooperative Highway Research Program
21. Nebraska Department of Roads
22. Nevada Department of Transportation

Points of Pride

COLLABORATORS

CONTINUED

- | | |
|---|---|
| 23. New York State Dept. of Transportation | 31. United Soybean Board |
| 24. New York State Energy Research and
Development Authority | 32. University of Arkansas, Fayette |
| 25. North Dakota Dept. of Transportation | 33. University of Nebraska-Lincoln |
| 26. North Dakota State University | 34. University of Nevada, Las Vegas |
| 27. Oklahoma Department of Transportation | 35. University of Nevada-Reno |
| 28. Oklahoma State University | 36. University of Texas at Austin |
| 29. Precast Concrete Institute | 37. Washington County, Missouri |
| 30. Texas Department of Transportation | 38. Women in Engineering Development Fund |
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Points of Pride



STUDENT OF THE YEAR AWARDS

WHERE ARE THEY NOW?



2013

Mahdi Arezoumandi

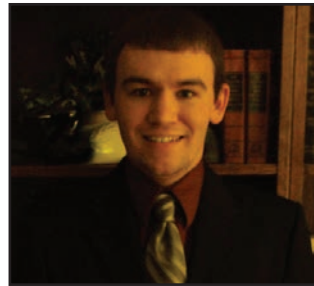
*Assistant Professor
Qatar University*



2012

Trevor Looney

*Structural Design Engineer
Wallace Engineering*



2011

Nathan Muncy

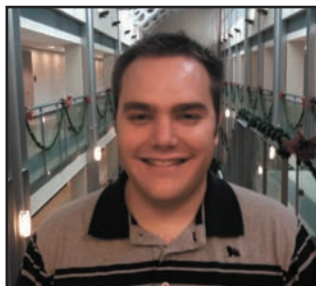
*Structural Engineer
Burns and McDonnell*



2010

Kandi Spraggs

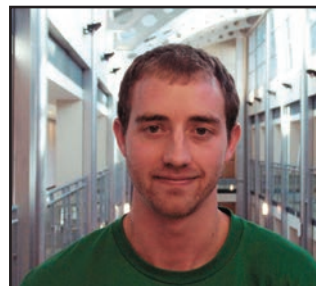
*Structural Engineer
TransSystems*



2009

Kurt Bloch

*Structural Engineer
Cannon Designs*



2008

Michael Murphy

*Structures Staff II
Simpson, Gumpertz & Heger Inc.*



2007

David Holdener

*Structural Engineer
TWM, Inc.*



2006

Jared Brewster

*Engineer
CTLGroup*

Points of Pride

ADVANCED CONSTRUCTION MATERIALS LABORATORY INAUGURATION



The **Advanced Construction Materials Laboratory (ACML)** was inaugurated by S&T Chancellor Schrader in April 2014. This event was a turning point in the research program for the S&T research team. With nearly \$2.8M of specialized equipment for the development, manufacturing, and implementation of advanced and sustainable materials for transportation infrastructure, this new lab will be the cornerstone in accomplishing many projects that will be undertaken to address the problems facing our nation's infrastructure.

Points of Pride

TRANSPORTATION INFRASTRUCTURE CONFERENCE SERIES



The annual **Missouri S&T/MoDOT Transportation Infrastructure Conference** series began in 2012 and serves a conduit for technology transfer for the Center. The annual conference showcases transportation-related projects dealing with advanced construction materials and structural systems, non-destructive testing and structural health monitoring of surface transportation infrastructure. The event highlighted a several projects sponsored by the Center for Transportation Infrastructure and Safety (CTIS). Each year, several prominent keynote speakers discussed issues ranging from transportation policy to crack sensing technologies for transportation infrastructure.