

College of Engineering
2012 Annual Report

Civil Engineering

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Civil infrastructure is the glue that holds our communities and, ultimately, our nation together. From the National Road between Cumberland, W.Va., and Vandalia, Mo., completed in 1839, to the newest stretch of the Eisenhower Interstate System, our highways help connect towns and cities across the country. And within and between these communities, streets, bridges, buildings, levees, reservoirs and water systems create the critical infrastructural framework for society to function.

At K-State civil engineering, we are delighted to educate tomorrow’s civil engineers and develop research-based innovative solutions to meet current and future infrastructure challenges. Our students, faculty, staff, advisory council and alumni work together to realize our vision of excellence in teaching, research and service activities associated with a nationally recognized civil engineering program.

It is a pleasure to present to you the 2012 annual report of the department of civil engineering at Kansas State University. In its 105th year since establishment in 1907, the civil engineering department enrolled 305 undergraduate and 71 graduate students, and awarded 47 B.S. and 29 M.S. degrees in 2012. Forty-nine undergraduate students received university or college scholarships worth more than \$120,000 and 68% of students sitting in the Fundamentals of Engineering examination in fall 2012 passed the test; the national average was 64%. The KSU steel bridge team ranked number one in the regionals and qualified for its eighth consecutive appearance at nationals.

The CE faculty includes 14 full-time professors and two instructors. As you will read in this report, all faculty members are active in research, most are licensed professionals, several serve on journal editorial boards, five are fellows of ASCE and four hold endowed professorships. In 2012, the department faculty had active projects worth more than \$11.3 million and annual expenditures exceeding \$2.3 million. CE faculty members have cumulatively authored more than 450 journal articles and, in 2012, they taught more than 7,000 student credit hours of undergraduate and graduate courses.

In this annual report, you will find information about activities related to the Civil Infrastructure Systems Laboratory, University Transportation Center, Mid-America Transportation Center, and CE undergraduate and graduate programs.

I invite you to read the entire report, and visit our website at www.ce.ksu.edu to learn more about our department and programs.

A handwritten signature in black ink that reads "Robert Stokes". The signature is fluid and cursive.

Robert W. Stokes, Ph.D., F.ASCE
 Interim Department Head
 Civil Engineering
 Director, Kansas State University Transportation Center

Faculty



Alok Bhandari, P.E., F.ASCE

Ph.D., Virginia Tech, 1995
M.S., Virginia Tech, 1992
B.S., Jawaharlal Nehru Technological University, India, 1990

Research: Environmental fate of pollutants in natural and engineered water systems; improved, cost-effective and sustainable methods of treating drinking water; wastewater, storm water and contaminated groundwater

Teaching: Introduction to civil engineering, environmental engineering fundamentals, wastewater engineering – biological processes



Sunanda Dissanayake, P.E.

Ph.D., University of South Florida, 1999
M.S., Asian Institute of Technology, 1993
B.S., University of Moratuwa, Sri Lanka, 1990

Research: Traffic engineering, traffic control systems, modeling and simulation of transportation systems to improve safety in urban and rural highways

Teaching: Route location and design, travel-demand modeling, transportation safety



Asad Esmaily, P.E.

Ph.D., University of Southern California, 2001
M.S., University of Southern California, 1998
B.S., Tehran University, Iran, 1987

Research: Smart bridge systems, feature-based structural damage detection, analytical performance of confined concrete models

Teaching: Structural engineering in concrete, advanced reinforced concrete theory, structural dynamics



Susan Gerth, P.E.

M.S., Kansas State University, 1982
B.S., University of Wisconsin-Platteville, 1978

Teaching: Strength of materials, statics and dynamics



Mustaque Hossain, P.E., F.ASCE

Ph.D., Arizona State University, 1990
M.S., Bangladesh University of Engineering and Technology, Bangladesh, 1986
B.S., Bangladesh University of Engineering and Technology, Bangladesh, 1983

Research: Highway materials, pavement design, pavement performance evaluation, non-destructive testing of pavements

Teaching: Engineering assembly, civil engineering materials, pavement design, sustainable transportation asset management



Alexander P. Mathews, P.E.

Ph.D., University of Michigan, 1975
M.S., University of Rhode Island, 1968
B.S., University of Madras, India, 1966

Research: Physicochemical processes including adsorption, ozonation and filtration for the treatment of water, wastewater, sludges and hazardous waste; biological waste treatment; fermentation by-products from wastes and renewable resources

Teaching: Environmental engineering fundamentals, water and wastewater engineering, water treatment processes, environmental chemistry

Faculty



Ryan McGrath, P.E.

M.S., University of Colorado-Boulder, 2000
B.S., University of Hawaii, 1995

Teaching: Elementary surveying, soil and foundation construction, advance surveying and civil design, water resources engineering



Hani G. Melhem, P.E., F.ASCE

Ph.D., University of Pittsburg, 1989
M.S., University of Pittsburg, 1987
B.S., Cairo University, Egypt, 1981

Research: Artificial intelligence and information systems, computer-controlled testing, experimental analysis, fatigue and fracture of structures, finite-element and numerical modeling of structures

Teaching: Statics, structural engineering in steel, civil engineering project, advanced mechanics of materials and applied elasticity



Natalie Mladenov

Ph.D., University of Colorado-Boulder, 2004
M.S., University of Colorado-Boulder, 1999
B.S., University of South Florida, 1995

Research: Surface and groundwater quality, natural organic matter reactivity and metal interactions, fluorescence and UV-absorbance spectroscopy, organic aerosols

Teaching: Environmental engineering fundamentals, sustainable water and sanitation systems, wastewater engineering: biological processes



Yacoub Najjar, P.E.

Ph.D., University of Oklahoma, 1990
M.S., University of Oklahoma, 1986
B.S., Yarmouk University, Jordan, 1983

Research: Application of artificial neural networks and computational mechanics to civil infrastructure, interaction of soil and civil structures, geomechanics, geosynthetics and geoenvironmental systems

Teaching: Foundation engineering, design with geosynthetics, neural networks in civil engineering



Dunja Perić

Ph.D., University of Colorado-Boulder, 1990
M.S., University of Colorado-Boulder, 1988
B.S., University of Zagreb, Croatia, 1981

Research: Experimental and computational modeling of localized deformation, failure and instabilities of geomaterials; development of sustainable reinforcement systems for civil infrastructure materials

Teaching: Soil mechanics, ABAQUS applications in geosystems



Robert J. Peterman, P.E.

Ph.D., Purdue University, 1996
M.S., Purdue University, 1989
B.S., Lafayette College, 1987

Research: Behavior of prestressed concrete structures, experimental testing of concrete materials, durability of bridge decks and time-dependent deformation in structures

Teaching: Mechanics of materials, prestressed concrete design



Hayder A. Rasheed, P.E., F.ASCE

Ph.D., University of Texas-Austin, 1996
 M.S., University of Baghdad, Iraq, 1990
 B.S., University of Baghdad, Iraq, 1987

Research: Structural engineering and computational mechanics with emphasis on stability and nonlinear analysis of fiber-reinforced composites, reinforced/pre-stressed concrete structures and materials
 Teaching: Introduction to structural analysis, advanced structural analysis-1, advanced structural analysis-2



Kyle A. Riding, P.E.

Ph.D., University of Texas-Austin, 2007
 M.S., University of Texas-Austin, 2004
 B.S., Brigham Young University, 2002

Research: Engineering assembly, durability of concrete structures and pavements, early-age concrete structural behavior, concrete microstructure characterization and modeling, novel cementitious systems
 Teaching: Statics, civil engineering materials



Steven K. Starrett, P.E., D.WRE, F.ASCE

Ph.D., Iowa State University, 1994
 M.S., Iowa State University, 1992
 B.S., University of Missouri-Rolla, 1989

Research: Surface water hydrology, urban non-point source pollution, artificial neural networks, application of geographical information systems (GIS) to water resources engineering, engineering ethics
 Teaching: Introduction to civil engineering, water resources engineering, hydraulics of open channels, advanced hydrology, codes and professionalism in engineering, leadership and diversity in engineering



David R. Steward, P.G.

Ph.D., University of Minnesota, 1996
 M.S., University of Minnesota, 1991
 B.S., University of Minnesota, 1983

Research: Surface water hydrology, integrated modeling approaches to understand the response of natural/social systems to human/climate-induced changes in groundwater use and availability, mathematics and computer modeling of groundwater flow, application of GIS geospatial technology to water resources
 Teaching: Hydraulic engineering; design of groundwater flow systems; numerical and analytical techniques for engineers, water and society



Robert W. Stokes, F.ITE, F.ASCE

Ph.D., Texas A&M University, 1984
 M.S., Ohio State University, 1977
 B.S., Antioch College, 1976

Research: Urban, rural and intercity transportation planning; highway design, planning and operations; traffic engineering; design and operation of turning lanes; traffic safety; transit planning, design and operations
 Teaching: Highway engineering, planning and management, economics of design and construction, land development for civil engineers and planners and design

Putting a footprint on the K-State Olathe campus

K-State Olathe, which officially opened April 26, 2011, as the newest member of the Kansas State University system, recently hosted an inaugural one and one-half day civil engineering workshop. The event, conceived by CE Professor Mustaque Hossain, was sponsored by the Mid-America Transportation Center (MATC), the Region 7 University Transportation Center of the U.S. Department of Transportation. K-State is a member of the MATC consortium, which is led by the University of Nebraska, Lincoln. CE doctoral student, Brandon Bortz (CE B.S. '08, CE M.S. '10) served as on-site coordinator.

Titled "Thin Surface Treatments for Bituminous Pavements," the workshop was intended to educate engineers, maintenance superintendents, inspectors, technicians and other personnel involved in the implementation of thin surface treatments for pavement preservation in Kansas. The material presented covered micro-surfacing, surface recycling, chip seal and ultra-thin bonded asphalt surface (UBAS). Instruction was provided by a select group from Dustrol, Inc., Towanda, Kan.; Ergon Asphalt and Emulsion, Inc., Salina, Kan.; Road Science, LLC., Tulsa, Okla.; and Vance Brothers, Inc., Kansas City, Mo. The workshop was timely due to the recent emphasis of highway agencies in pavement preservation. It was attended by 35 engineers and other personnel from the Kansas Department of Transportation, Kansas Turnpike



Authority (KTA), city of Overland Park, and the city of Hays among others.

"The class was excellent," commented Luke Coltrane (CE B.S. '96), a KTA construction engineer who attended with some of his staff. "It was well put together and filled with speakers who were knowledgeable in their fields. They presented their information well and intelligently answered all facets of questions. I would recommend the class to anyone involved in the paving industry from the contracting side, a municipality or even a statewide government agency."

Complementing the main campus in Manhattan and the College of Technology and Aviation in Salina, the Olathe campus is the academic research presence within the Kansas Bioscience Park, leveraging K-State's broad capabilities and its many resources on the Manhattan campus. K-State Olathe is also home to the Urban Water Institute, founded by the late Alok Bhandari, former CE professor and department head.



Participants in K-State Olathe class on thin-surface treatments for bituminous pavements

Adding advanced testing capabilities for Superpave asphalt mixture

K-State CE has had excellent laboratories facilities for asphalt since the late 1990s. The genesis of these facilities lay in the establishment of a Superpave Asphalt Laboratory by the Kansas Department of Transportation (KDOT) in 1996. The objective was to do research and training in the then newly formulated Superpave asphalt mixture design in the Strategic Highway Research Program (SHRP), a federal initiative to upgrade asphalt mixture design for the 21st century.

“The Superpave Asphalt Laboratory has been invaluable to KDOT. This facility has educated all technicians and engineers involved with KDOT Superpave asphalt mixes across the state. In addition, the research partnership between KDOT and K-State CE has benefited through numerous research projects, which permitted several improvements to the asphalt specifications,” said Rick Kreider, P.E. (CE B.S. '91), chief of the bureau of materials and research of KDOT.

These laboratories have a combined area of 1,638 sq. ft. in Fielder Hall. The Superpave Asphalt Laboratory equipment includes Marshall molds and hammers, Marshall stability tester, multiple theoretical maximum specific-gravity test set-

ups, multiple lab ovens, a rolling thin film oven, table-top and high-capacity mixers, two Pine Superpave Gyratory compactors and two binder ignition ovens. This laboratory is now used for the undergraduate CE materials class and research, sometimes in support of experiments at CISL. The Superpave Field Laboratory Technician Certification training, a four-day course offered jointly by K-State and KDOT, also makes use of this laboratory for hands-on training and performance testing. This course is intended to certify engineers, technicians and other personnel who will be involved in construction of Superpave hot-mix asphalt (HMA) pavements using quality control and quality assurance specifications in the state of Kansas. The course is required for all KDOT and contractor personnel performing tests on Superpave projects. Instruction is provided by a select group of instructors from KDOT, HMA industry and K-State. The successful program in 2012 brought the total number of participants completing this training since 1997 close to 1,500.

In 2000, the Kansas Asphalt Pavement Association (KAPA), under the leadership of Jim Jones (CE B.S. '64), led a fund-raising drive to name the Superpave Asphalt Labora-

tory in the newly built Fiedler Hall and to buy advanced equipment such as the Hamburg rut tester. A separate Advanced Asphalt Laboratory was established that contained the Hamburg rut tester and a linear, kneading compactor for making slab specimens. K-State is the only agency in the state that owns a Hamburg rut tester. Liquid binder test equipment required by SHRP, a dynamic shear rheometer and a bending beam rheometer, were added to this laboratory. K-State also purchased a universal testing machine manufactured by Industrial Process Control, Melbourne, Australia, for hot-mix asphalt mixture research. K-State also owns a fatigue test setup from IPC. Since 2000, these laboratories have been used in 22 research projects funded by KDOT; state departments of transportation from Iowa, Missouri, Nebraska, New York and Missouri; and the U.S. Department of Transportation. Currently, the Advanced Asphalt Laboratory also provides Hamburg rut testing services to the asphalt industry in Kansas.

In 2012, KDOT purchased a \$68,000 asphalt mixture performance tester (AMPT) for this laboratory for research on second-generation Superpave mixtures. The AMPT conducts the following three tests: (1) dynamic modulus—measures a stiffness value for the asphalt pavement mixture, an input in the AASHTO Mechanistic-Empirical Pavement Design Guide (DARWin-ME); (2) repeated load (flow number)—simulates driving a heavy vehicle repeatedly over a sample of pavement; output is the number of load cycles the pavement can tolerate until it flows; and (3) static creep (flow time)—simulates a heavy vehicle standing on a pavement specimen, much as a truck might apply steady pressure to pavement while waiting at a red light; output for this test is flow time, which is the length of time the pavement can withstand the steady pressure until flow occurs.

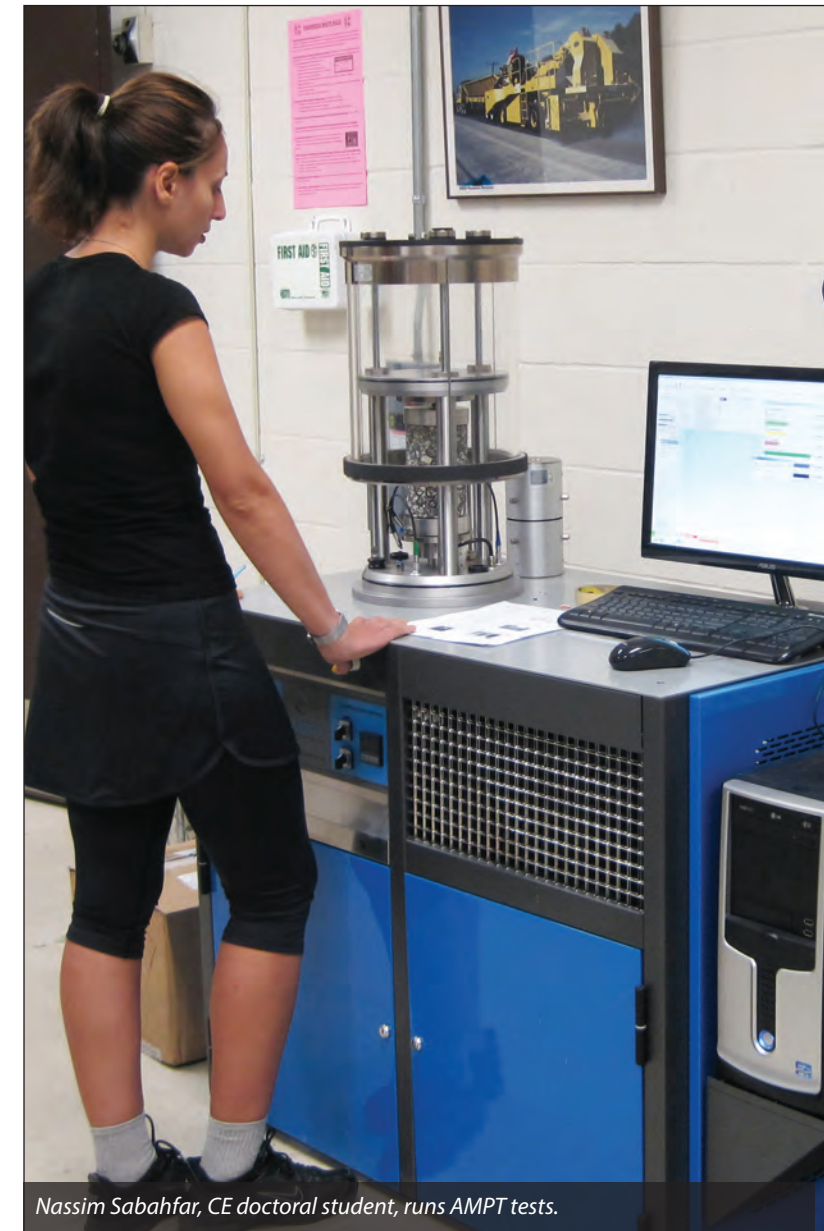
K-State CE also has spent another \$15,000 in 2012 to upgrade the AMPT to do other advanced tests such as the Texas overlay and NCSU direct-tension fatigue tests. A research project using these tests to develop more durable Superpave mixtures in Kansas has been approved by KDOT and is waiting budget approval.



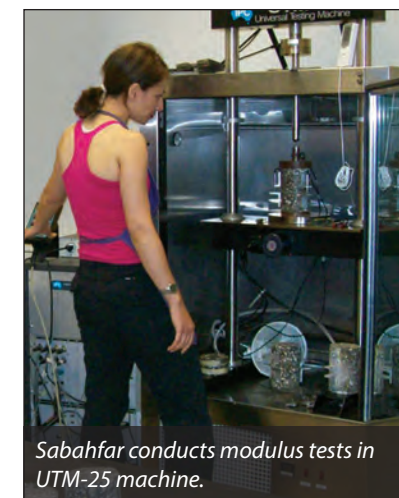
Superpave Asphalt Laboratory (1)



Superpave Asphalt Laboratory (2)



Nassim Sabahfar, CE doctoral student, runs AMPT tests.



Sabahfar conducts modulus tests in UTM-25 machine.



Sabahfar conducts Hamburg rut tests.

Publications

Books, Monographs and Book Chapters

Structural Engineering

- Albahtiti, M. and Rasheed, H. A., "Wheat Fiber from a Residue to a Reinforcing Material," LAP LAMBERT Academic Publishing, ISBN-10-3659207055, ISBN-13-9783659207051, 2012, p. 148.

Environmental Engineering

- C. Van der Post, N. Mladenov, J. Mbaiwa, M. Murray-Hudson, P. Wolski, L. Magole, D.L. Kgathi, G. Mmopelwa, L. Ramberg, and S. Ringrose. 2012. "Sustainable Development of the Okavango Delta," In Tropical Wetland Management: The South-American Pantanal and the International Experience. A. Ioris, Ed. Ashgate publishers.

Journal Publications

Environmental Engineering

- N. Mladenov, M.W. Williams, S. K. Schmidt, and K. Cawley. 2012. Atmospheric deposition as a source of carbon and nutrients to the barren, alpine environment of the Colorado Rocky Mountains. *Biogeosciences*, 9, 3337-3355.
- T. M. Legg, Y. Zheng, B. Simone, K. Radloff, N. Mladenov, A. González Peña, D. Knights, M. M. Rahman, K. M. Ahmed, D.M. McKnight, and D.R. Nemergut. 2012. Bacterial Community Structure Influenced by Sedimentary Carbon and Metal Content in High As Aquifers. *FEMS Microbiology*, 3:82, doi: 10.3389/fmich.2012.00082.
- K. Cawley, P. Wolski, N. Mladenov, and R. Jaffe. 2012. Transformations of dissolved organic matter (DOM) and water chemistry along a transect of the Okavango Delta, Botswana. *Wetlands*, DOI: 10.1007/s13157-012-0281-0.

Structural Engineering

- Qiao, L., Esmacily, A., and Melhem, H. G. (2012). "Signal pattern recognition for damage diagnosis in structures." *Computer-Aided Civil and Infrastructure Engineering*, 27(9), 699-710 – Impact Factor: 3.382.
- Hayder A. Rasheed, Ahmed M. Abd El-Fattah, Asad Esmacily, John P. Jones, and Kenneth F. Hurst. "Software for Adaptable Eccentric Analysis of Confined Concrete Circular Columns," *Computers and Concrete*, Vol. 10, No. 4 (2012) 331-347.
- Abdul Halim Halim, Hayder A. Rasheed, and Asad Esmacily (2012): "Evaluation of shear design provisions for shear-critical concrete beams," *The IES Journal Part A: Civil & Structural Engineering*, 5:2, 106-116.

- Abdul Halim Halim, Asad Esmacily and Hayder A. Rasheed (2012): "Behaviour of RC beams under combined shear and torsion according to AASHTO LRFD and ACI equations," *The IES Journal Part A: Civil & Structural Engineering*, 5:2, 95-105.

Transportation and Materials Engineering

- Abdoulaye Balde and Sunanda Dissanayake, "Optical Speed Bars as a Low-Cost Measure to Manage Approach Speeds in Rural Communities," *Journal of Transportation Safety and Security*, Published Online, December 2012.
- Sunanda Dissanayake and Abhishek Parik, "Self-Reported Behavior, Perceptions and Attitudes of Drivers Regarding Seat Belt Use: A Descriptive Study," *Advances in Transportation Studies, An International Journal*, Volume XXVI, April 2012.
- Lange, S.C.T, Riding, K.A., and Juenger, M.C.G., "Increasing the Pozzolanic Reactivity of Metakaolin with a ZnO Flux," *Cement and Concrete Composites*, Vol. 34, No. 7, 2012, pp. 835-847. *JCR Journal Impact Factor: 2.421*.
- Riding, K.A., Poole, J.L., Folliard, K.J., Juenger, M.C.G., and Schindler, A.K., "Modeling the Hydration of Cementitious Systems," *ACI materials Journal*, Vol. 109, No. 2, 2012, pp. 225-234. *JCR Journal Impact Factor: 0.803*.
- Siddiqui, M.S., and Riding, K.A., "Effect of Calculation Methods on Cement Paste and Mortar Apparent Activation Energy," *Advances in Civil Engineering Materials*, Vol. 1, No. 1, 19 pp., 2012.

Water Resources Engineering

- Ahring, T. S. and D. R. Steward, Groundwater surface water interactions and the role of phreatophytes in identifying recharge zones, *Hydrology and Earth System Sciences*, 16, 4133-4142, 2012.

Reports

Geotechnical Engineering

- Momeni, F., Riding, K., and Perić, D. (2012). "Effect of Y-cracking on CRC pavement performance," submitted to Oklahoma Department of Transportation in 2012.

Structural Engineering

- K. Riding, A. Esmacily, and M. Mirzahosseini. "Measurement of the Pore-Size Distribution of Limestone Aggregates in Concrete Pavement Cores, Phase I," Report Number: KS-12-1, publication date: April 2012.
- Abd El Fattah, A. M., Rasheed, H. A. and Esmacily, A. "LRFD software for design and actual ultimate capacity of confined rectangular columns," KTRAN project KSU-10-06 and KSU-11-03.

- Albahtiti, M. T., Rasheed, H. A., Perić, D. and Davis, L. "EAGER: Engineered Bio-composites for Sustainable Concrete," NSF Final Report, National Science Foundation, submitted in August 2012, approved in August 2012.
- Peterman, R., "Evaluation of As-Cast Strand-Depth on Transfer and Development Length in Concrete Mixes with Different Fluidity," final Report Submitted to the Precast/Prestressed Concrete Institute (PCI), July 2012, 124 pages.
- Murphy, R., Peterman, R., and Zhao, W., "Determining the Stresses in Steel Railroad-Track Rails Due to Freight Movements Using Non-Contact Laser-Speckle," final report submitted to the Mid-American Transportation Center (MATC), 2012, 47 pages.
- Murphy, R., Peterman, R., Zhao, W., and Beck, B., "Determining the Transfer Length in Prestressed Concrete Railroad Ties Produced in the United States," final report submitted to the Mid-American Transportation Center (MATC), 2012, 264 pages.

Transportation and Materials Engineering

- Sunanda Dissanayake and Niranga Amarasingha, "Identification of Safety Belt Restraint Usage Characteristics Related to 5-14 Year Olds," Draft Final Report Submitted to the K-TRAN program of Kansas Department of Transportation, August 2012.
- Sunanda Dissanayake and Niranga Amarasingha, "Improving Safety of Teenage and Young Adult Drivers in Kansas-Phase I," Draft Report Submitted to the K-TRAN program of Kansas Department of Transportation, July 2012.
- Sunanda Dissanayake and Niranga Amarasingha, "Effects of Geometric Design Features on Truck Crashes on Limited-Access Highways," Draft Final Report Submitted to Mid America Transportation Center, June 2012.
- Sunanda Dissanayake and Siddhartha Kotikalapudi, "Characteristics and Contributory Causes Related to Large Truck Crashes (Phase II)," Final Report Submitted to Mid America Transportation Center, March 2012.
- Mummaneni, S.K., and Riding, K.A., "Evaluation of Canadian Unconfined Aggregate Freeze-Thaw Tests for Identifying Nondurable Aggregates," Report No. K-TRAN: KSU-10-9, Final Report, June, 2012, 82 pp.
- Riding, K.A., Stokes, R.W., Carter, D., Keen, J., Sreerama, R.K., Vemula, V., and Kona, S., "Establishment of a Carbon Emissions Baseline for the Kansas Department of Transportation Phase 1A: Buildings," Report No. K-TRAN: KSU-11-1, Final Report, March, 2012, 51 pp.



Water Resources Engineering

- Steward, D. R., Aistrup, J. A., Kulcsar, L., Peterson, J. M., Welch, S. M., and Andresen, D., REPORT FOR AWARD # 0909515, CNH: Hyper-Extractive Economies and Sustainability: Policy Scenarios for Sustainable Water Use in the High Plains Aquifer, NSF, September 7, 2012.
- Rainwater, K., Hayhoe, K., Hernandez, A., Maugey, S., Johnson, J., Steward, D. R., Staggenborg, S. and S. Welch, Incorporating climate variability into agricultural production and Ogallala Aquifer depletion forecasts, USDA/ARS, April 6, 2012.

Presentation and posters (without a written portion)

Environmental Engineering

- H. Enriquez, N. Mladenov, P. Wolski, G. Hettiarachchi, D. McKnight, J. Ebert, P. Huntsman-Mapila, M. Murray-Hudson, W. Masamba, and S. Damaraju. Influence of abiotic and biotic processes on the mobilization of arsenic in groundwater of the Okavango Delta, Botswana. *Geological Society of America*, Chapel Hill, NC, USA, 2012 (Talk).

- **N. Mladenov, M. W. Williams, S. K. Schmidt, and A. E. Blum.** The role of dust on snow and other aeolian inputs in biogeochemical cycling in barren, alpine catchments. LTER All Scientists Meeting, Estes Park, CO, USA, 2012 (Poster).
- **C. Naff, J. L. Darcy, N. Mladenov, M. W. Williams, and S. K. Schmidt.** Identification and characterization of microbial communities in high-elevation snowpacks. LTER All Scientists Meeting, Estes Park, CO, USA, 2012 (Poster).
- **N. Mladenov, D. M. McKnight, B. Simone, T. Legg, D. Nemergut, J. Ebert, K. A. Radloff, and Yan Zheng.** Influence of DOM quality on arsenic mobilization in a Bangladesh Aquifer. Goldschmidt Conference, Montreal, Canada, 2012 (Talk).

Geotechnical Engineering

- **Smith, W., Bartley, P., and Perić, D.** “Feasibility of Using Lignin-A Plant-Derived Material for Sustainable Stabilization of Unpaved Roads,” presented at the Capitol Graduate Research Summit, February 16, 2012, Topeka, Kansas.
- **Perić, D.** “Challenges and Opportunities for U.S.-Russian Collaboration,” presented at the Russia-U.S. Geotechnical Engineering Workshop, March 29-30, 2012, Oakland, California, participation by invitation only.

Structural Engineering

- Presented by **Dr. H. Melhem, Inayat A., Melhem H., and Esmaily A.**, “Critical Success Factors for Different Organizations in Construction Projects,” 2nd International Conference for Sustainable Design, Engineering and Construction, ICSDEC2012 (<http://icsdc.ci-asce.org/>), Fort Worth, TX, November 8, 2012.
- **Abd El-Fattah, A. and Rasheed, H. A.**, “Confinement Analysis for Circular and Rectangular Concrete Columns in Tall Buildings,” ACI Spring Convention, March 18-22, 2012, Dallas, TX, Convention program p. 202.
- **Rasheed, H.A., Perić, D., Davis, L. and Alhahtiti, M.T.** (2012). “EAGER: Engineered Bio-Composites for Sustainable Concrete,” presented at NSF CMMI Engineering Research and Innovation Conference, July 9-12, 2012, Boston, Massachusetts.
- **Rasheed, H. A. and Alkhrdaji, T.** “Assessment of Concrete T-Beams Strengthened with Enlarged Reinforced Section,” ACI Fall Convention, Oct. 21-25, 2012, Toronto, ON, Canada, Convention program p. 150.
- **Rasheed, H. A., Traplsi, A., Wuertz, A., and Alkhrdaji, T.** “Combined Externally Bonded GFRP and NSM Steel Bars for Improved Strengthening of Concrete Beams,” ACI Fall Convention, Oct. 21-25, 2012, Toronto, ON, Canada, Convention program p. 166.

- **Peterman, R.** “Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties,” presentation given to PCI Industry Advisory Committee for FRA Project, PCI Committee Days, Chicago, IL, March 2012.
- **Riding, K., and Peterman, R.** “Determination of Acceptance Criteria For Prestressing Strand in Pretensioned Applications,” presentation given to NASP Strand Bond Task Force, PCI Committee Days, Chicago, IL, March 2012.
- **Peterman, R.** “Results From Transfer Length Measurements At Six Concrete Tie Plants in the United States,” presentation given at Kansas Transportation Engineering Conference, Manhattan, Kansas, April 2012.
- **Peterman, R.** “Results From Transfer Length Measurements At Six Concrete Tie Plants in the United States,” presentation given at International Concrete Tie Symposium, University of Illinois, June 2012.
- **Peterman, R.** “Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties,” presentation given to PCI Industry Advisory Committee for FRA Project, 2012 PCI Convention, Nashville, TN, September 2012.
- **Peterman, R.** “An Automated Transfer Length Measurement System for Use on Concrete Railroad Ties,” presentation given at Evaluating Design Assumptions Session, 2012 National Bridge Conference, Nashville, TN, September 2012.

Transportation and Materials Engineering

- **Maduragoda, K., Samarasinghe, A., Sandaruwan, A., Wickramasinghe, V., and Sunanda Dissanayake,** Pedestrians’ Route Choice Behaviour Inside an Urban City Center in a Developing Country, Peradeniya University Research Sessions (PURSE-2012), Peradeniya, Sri Lanka, November 2012.
- **V. Wickramasinghe and Sunanda Dissanayake,** Characteristics of Pedestrian Crashes in Kandy District, Peradeniya University Research Sessions (PURSE-2012), Peradeniya, Sri Lanka, November 2012.
- **Ataie, F.F., Taylor-Lange, S.C., Burris, L., Riding, K.A., and Juenger, M.C.G.**, “Collaborative Research: New Natural Supplementary Cementitious Materials for Concrete,” Poster Presentation, NSF CMMI Research and Innovation Conference, July 9-11, 2012, Boston, MA, Invited by Yick Grace Hsuan.
- **Mirzahosseini, M., and Riding, K.A.**, “The Effects of Temperature on Glass Hydration in Cementitious Systems,” American Concrete Institute Spring Convention, Dallas, TX, March 20, 2012, Invited by Gaurav Sant.
- **Mirzahosseini, M., and Riding, K.A.**, “Study of the Simul-

- **taneous Effect of Size and Type of Glass Cullet, and Curing Temperature on the Rate of Glass Reactivity,”** 3rd ACerS-ACBM Advances in Cement-Based Materials, June 10-12, 2012, Austin, TX.
- **Ataie, F., Riding, K.A., and Juenger, M.C.G.**, “From Wheat Straw to Supplementary Cementitious Materials,” Poster Presentation, 3rd ACerS-ACBM Advances in Cement-Based Materials, June 10-12, 2012, Austin, TX.
- **Riding, K.A., and Ataie, F.**, “Enhancement of Agricultural Residue Ash Reactivity in Concrete Through the Use of Hydrothermal Pretreatment Processes,” Anna Maria Workshop XIII: Unconventional Concrete, Holmes Beach, FL, Nov. 7-9, 2012.
- **Juenger, M.C.G., Taylor-Lange, S., and Riding, K.A.**, “The Use of Impure Clays as Supplementary Cementitious Materials,” Anna Maria Workshop XIII: Unconventional Concrete, Holmes Beach, FL, Nov. 7-9, 2012.
- **Riding, K.A., Peterman, R.J., and Polydorou, T.**, “Determination of Acceptance Criteria for Prestressing Strand in Pretensioned Applications,” PCI National Bridge Conference, Nashville, TN, Sept. 30, 2012.

Water Resources Engineering

- **Steward, D. R.**, Groundwater to sustain agriculture in the Midwest’s prairies: Interdisciplinary, integrated modeling approaches, 57th Midwest Ground Water Conference, plenary session, Minneapolis, MN, October 1-3, 2012.
- **Steward, D. R.**, Interdisciplinary water approaches fusing disciplinary knowledge, 3rd Water Research Horizon Conference, Helmholtz Institute, Berlin, Germany, July 10-11, 2012.
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- **Steward, D. R., Aistrup, J., Kulcsar, L., Peterson, J. M., Welch, S. M., Andresen, D., Bernard, E. A., Staggenborg, S. A., and T. Bulatewicz,** Integrated, interdisciplinary water resources studies using the Simple Script Wrapper, Governor’s Conference on Future of Water in Kansas, Manhattan, KS, October 30-31, 2012.
- **Allen, A. J. and D. R. Steward,** The Non-Linear Response of Groundwater-Surface Water Interactions in the Ogallala Aquifer, Governor’s Conference on Future of Water in Kansas, Manhattan, KS, October 30-31, 2012.
- **Allen, A. J. and D. R. Steward,** Analytic Element Modeling of the High Plains Aquifer: Parameter estimation of ground-

- **water-surface water interaction rates,** 57th Midwest Ground Water Conference, Minneapolis, MN, October 1-3, 2012.
- **Auvenshine, S. D. and D. R. Steward,** Identifying controls on infiltration capacity to predict recharge, 57th Midwest Ground Water Conference, Minneapolis, MN, October 1-3, 2012.
- **Bulatewicz, T., Allen, A. J., Peterson, J. M., Staggenborg, S. A., Welch, S. M. and D. R. Steward,** The Simple Script Wrapper for OpenMI: Enabling interdisciplinary water studies, 57th Midwest Ground Water Conference, Minneapolis, MN, October 1-3, 2012.
- **Brace, E. C. and D. R. Steward,** Water and food: The effects of the decrease in water supplies on agriculture, Kansas State University’s Developing Scholars Program, 12th Annual Research Poster Symposium, Manhattan, KS, April 22, 2012.
- **W. L. Duren and D. R. Steward,** The future of algae, Kansas State University’s Developing Scholars Program, 12th Annual Research Poster Symposium, Manhattan, KS, April 22, 2012.

Engineering Education and Professional Practice

- **Starrett, S.K.** Spring 2012. Engineering Your Way Through Ethical Dilemmas. ASCE Webinar.
- **Starrett, S.K.** Fall 2012. Engineering Your Way Through Ethical Dilemmas. ASCE Webinar.

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Structural Engineering

- **Inayat A., Melhem H., and Esmaily A.**, “Critical Success Factors for Different Organizations in Construction Projects,” proceedings of the 2nd International Conference for Sustainable Design, Engineering and Construction, ICSDEC2012 (<http://icsdc.ci-asce.org/>), Fort Worth, TX, November 7-9, 2012.
- **Amelia Fader, Abdelmoneam Raef, and Assad Esmaily,** “Integration of Downhole Acoustic Televiewer Imaging, Ultrasonic Laboratory Shear Waves Velocity Measurements and Multi-channel Analysis of Surface Waves for Geotechnical Site Characterization: Riley and Douglas Counties Sites, Kansas, USA,” SAGEEP 2012.
- **H. Poole, H. Melhem, M.El-Aasar, and D. Meggers.** “Determination of a Load Distribution Factor for an FRP Panel Supported by Steel Beams,” Accepted for publication in Transportation Research Board Annual Meeting compendium of Papers.



- Asfandyar Inayat and **Hani Melhem**, “Critical Success Factors for Different Organizations in Construction Projects,” Proceedings of the 29th International Conference on Applications of IT in the AEC Industry (CIB W78 2012) held in Beirut, Lebanon, 17-19 Oct. 2012, paper #49, Lebanese American University, pp 313-322.
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- Nayyeri, S. and **Rasheed, H. A.** (2012) “Nondestructive Method To Predict the Buckling Load in Elastic Spherical Shells,” Proceedings of the IJSSD SYMPOSIUM 2012 on Progress in Structural Stability and Dynamics, 14-16 April 2012, Nanjing, China.
- Saqan, E., **Rasheed, H. A.**, and Hawileh, R. (2012) “Flexural Strengthening Of RC Beams Using ACI 440.2R-08: Design Aids,” 6th International Conference on Advanced Composite Materials in Bridges and Structures (ACMBS), Kingston, Ontario, Canada, 22-25 May 2012. Paper on CD.
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- “Artificial Intelligence Helps Bring Objectivity to Bridge Health Evaluations,” ASCE Civil Engineering Magazine, Technology Section, Sept. 2012, pp. 40-41.
- Zhao, W., Beck, B., **Peterman, R.**, Murphy R., Wu, C.H., Lee, G., and Bloomfield, J., “An Automated Transfer Length Measurement System for Use on Concrete Railroad Ties,” proceedings from 2012 PCI Conventions and National Bridge Conference, Sept–Oct 2012, 19 pages.
- Haynes, M., Wu, C.H., Beck, B., and **Peterman, R.**, “Non-Contact Measurement of Wire Indent Profiles on Prestressing Reinforcement Steel,” proceedings from 2012 AREMA Conference and Exposition, Chicago, IL, September 2012, 21 pages.
- Zhao, W., Beck, B., **Peterman, R.**, and Wu, C.H., “Portable Modular Optical Sensor Capable of Measuring Complex Multi-Axis Strain Fields,” proceedings from 2012 SPIE Optics and Photonics Meeting, San Diego, CA, August 2012, 16 pages.

Transportation and Materials Engineering

- **Sunanda Dissanayake** and Uttara Roy, “Run-Off-Road Crashes: Characteristics, Contributory Causes, and Severity Affecting Factor,” Mid-Continent Transportation Research Forum, Sep 6-7, 2012, Madison, Wisconsin.
- **Sunanda Dissanayake** and Siddhartha Kotikalapudi, “Identification of Characteristics and Severity Analysis of Large Truck Crashes Using Binary Logit Model,” Mid-Continent Transportation Research Forum, Sep 6-7, 2012, Madison, Wisconsin.
- Abeyssekara, P.T.N., Senanayake, M.P.D.S.R.K., Senvirathne, S.T.R., Wickramasinghe, V., and **Sunanda Dissanayake**. Criteria for Setting Speed Limits for Sri Lankan Roadways, Proceedings of the Civil Engineering Research Exchange Symposium (CERES) 2012, University of Ruhuna, Sri Lanka, 2nd July, 2012.
- Niranga Amarasinghe and **Sunanda Dissanayake**, “Modeling the Injury Severity of Young Drivers Using Highway Crash Data from Kansas,” 53rd Annual Transportation Research Forum, Tampa, FL, March 15-17, 2012.
- **Sunanda Dissanayake** and Uttara Roy, “Severity Analysis of Single Vehicle Run-Off-Road Crashes Using Kansas Data,” 53rd Annual Transportation Research Forum, Tampa, FL, March 15-17, 2012.
- Vasantha Wickramasinghe, Aruna Priyankara, and **Sunanda Dissanayake**, “Evaluation of Pedestrians’ Illegal Road-Crossing Behavior in Developing Countries Using Conjoint Analysis,” 91th Annual Meeting of the Transportation Research Board, Washington, DC, January 23-27, 2012.
- **Riding, K.A.**, **Peterman, R.J.**, Polydorou, T., and Ren, G., “Simple mortar mixture proportioning method for meeting minimum and maximum flow and strength requirements,” Proceedings of PCI National Bridge Conference, Nashville, TN, Sept. 29-Oct. 3, 2012.

Water Resources Engineering

- Yang, X. and **Steward, D. R.**, Explore the Interactions between Human-induced Groundwater Salt Intrusion and Salt Cedar Invasion in the Upper Arkansas River Corridor in Kansas, U.S., 21st Annual Conference of the IEEE Industrial Electronics Society (ICESE 2011), Hong Kong, China, Procedia Environmental Sciences, 12(B), 744-750, 2012.



Urban Water Institute

The Kansas State University Urban Water Institute, Professor Alok Bhandari, founding director, is now headed by biological and agricultural engineering professor, Stacey Hutchinson. The institute is physically located on the Olathe campus of K-State and interacts closely with faculty on the Manhattan campus.

Water has been identified as one of the most critical resources for the state of Kansas, the Kansas City metro area, the nation and indeed the globe. The National Academy of Engineering has identified 14 grand challenges for the 21st century. Water plays a key roll in three of these—providing access to clean water, restoring and improving urban infrastructure, and managing the nitrogen cycle. Several of the United Nation’s Millennium Development Goals are directly or indirectly tied to water quantity and water quality. These include reducing child mortality rate, improving maternal health, combating malaria and other diseases, ensuring environmental sustainability and even providing active universal primary education.

The Urban Water Institute’s location on the K-State Olathe campus is ideal as the Kansas City metropolitan area is home to a variety of world-renowned agencies, businesses and organizations that focus on water. The U.S. EPA Region 7 office located in Kansas City, Kan., focuses on protecting and improving water quality across America’s greatest watershed, the Missouri-Mississippi Basin. Major international water-related businesses including consulting firms, equipment manufacturers and testing service providers call the Kansas City metro area their home. By being strategically located on the Olathe campus, the Urban Water Institute will help connect the water industry in the KC region with more than 50 water experts and affiliates at Kansas State University’s Manhattan campus. Assistant Professor Natalie Mladenov, Associate Professor Steve Starrett and Professor David Steward, all CE, serve among the institute’s core faculty, and Steward also serves on the institute’s faculty advisory committee.

The vision of the Urban Water Institute is to be a premier center of knowledge and outreach focused on sustainable water management in urban environments. Its mission is to advance and promote public policy, water management approaches, and treatment technologies that support sustainable water use in urban and urbanizing communities. With its relationship with Kansas State University, the Urban Water Institute is part of the 2025 plan for the university—to be recognized as one of the nation’s top 50 public research universities.

The K-State Urban Water Institute is supported by four KSU colleges—the College of Engineering, College of Arts and Sciences, College of Agriculture, and College of Architecture, Planning and Design. The institute recently launched its website: www.k-state.edu/urbanwaterinstitute.

Civil Infrastructure System Laboratory

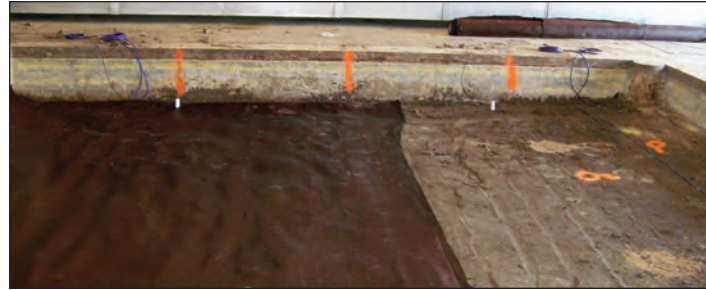
The Civil Infrastructure System Laboratory (CISL) is a unique facility operated by the civil engineering department at K-State. The mission of the laboratory is to test civil infrastructure elements under full-scale loading. The main indoor part of the facility is for accelerated pavement testing (APT) and for calibrating falling-weight deflectometer (FWD) (now defunct). The outdoor part includes apparatus for load testing of full-scale bridge members, and an area for conducting concrete strength and durability tests under real-world environmental conditions.

The APT load assembly consists of a test frame in which a bogie with dual wheels can move forward and backward while a load is applied hydraulically (reacting against two main longitudinal girders). Tests can be conducted on three, 20-ft long and 16-ft wide test pits that can accommodate asphalt or concrete pavements. Lateral traffic wander can be applied in 0.5-inch increments, to a maximum wander of ± 6 inches, to simulate actual highway truck traffic distribution on the lane. Temperature of the pavement can be controlled within the range of –10°F to 140°F.

The wheel assembly consists of a single or tandem axle with airbag suspension. The wheel assembly is an actual bogie from a standard truck. Loading of the axle is achieved by varying hydraulic pressure. At the end of the 20-ft travel, an energy absorption and release system transforms the kinetic energy of the carriage into potential energy in the springs. Compressed springs are used to launch the bogie in the opposite direction. It is also possible to achieve simulated one-way traffic using a hydraulic pump that can lift the wheels off the pavement surface after travel in one direction is completed.

In 2012, the work at CISL focused on conducting APT on geosynthetics-reinforced bases with varying base and asphalt layer thicknesses. This research project is being sponsored by Tencate Geosynthetics of the Netherlands. Full-scale testing was done on four lanes of pavement test sections to evaluate structural effects of

Programs



geotextile-reinforced base layers on asphalt layer thickness. Three out of these four sections were reinforced by different types of woven geotextiles and had lower base thicknesses than the control section. These three sections and the control section with unreinforced base were paved by similar Superpave hot-mix asphalt (HMA). Base and subgrade material was the same for all sections while the test sections had different asphalt layer thicknesses. Each section was instrumented with two pressure cells at the top of the subgrade, six strain gages on the geotextile, six H-bar strain gages at the bottom of HMA layer, two thermocouples and one time-domain reflectometer (TDR). All sections were loaded to 250,000 repetitions of an 80-kN single-axle load. The mechanistic response and surface deformation of each section were monitored at selected number of wheel passes. Data was analyzed to examine the effects of geotextile-reinforced base on pavement performance. Results of this study indicate that one of the geotextiles used resulted in comparative performance as the control section, but with reduced base and asphalt layer thicknesses. That woven geotextile has an ultimate wide-width strength of 66 kN/m in the machine direction and 53 kN/m in the cross direction. Tencate has sponsored another project to verify this finding that is being conducted now at CISL.

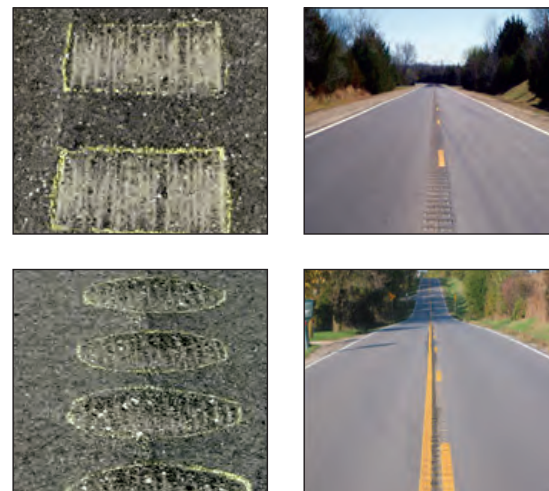
University Transportation Center

While only about 40 percent of all vehicle miles are traveled on the four million miles of rural roadways in the United States, nearly 60 percent of the traffic accident fatalities occur on these roads. When adjusted for miles traveled, this fatality rate is nearly 2.5 times greater than that from accidents on urban roads. With longer driver response times due to a rural lifestyle, the likelihood of more severe crashes and a higher probability of rollovers, rural transportation safety is a national concern. The deteriorating rural transportation infrastructure and an aging rural population have further compounded the issues related to safety of rural transportation systems.

The need for a safer rural transportation system under resource-limited conditions requires innovative approaches that consider the sustainability of rural economics and communities; transportation resources will have to go further and do more than ever before. Rural transportation systems not only support motorists and rail traffic, but also continue to carry the majority of the nation's food supply. Thus, the safety and security of the rural transportation infrastructure is also influenced by the integrity of the rural transportation infrastructure.

Housed in the department of civil engineering, the K-State University Transportation Center (UTC) facilitates research, education and outreach associated with the sustainability and safety of rural transportation systems and infrastructure. The K-State UTC is one of 60 federally funded UTCs in the U.S. established under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users enacted in 2005. As a Tier II Center, the K-State UTC receives approximately \$450,000 of federal funding each year that is supplemented by an equivalent amount of state funds through the Kansas Department of Transportation's Kansas Transportation Research and New-Developments (K-TRAN) program.

The K-State UTC supports rural transportation system



research by providing scholarships, graduate research assistantships, tuition, travel support and research funds to faculty in civil engineering, as well as electrical engineering, industrial engineering and economics. Since its establishment in 2006, the UTC has secured and distributed more than 2.3 million dollars in research funding that has supported 30 research projects beyond those funded by the K-TRAN program. The center has awarded 45 scholarships and 45 graduate research assistantships.

Professor Robert Stokes has served as the director of the K-State UTC since 2008. In 2012, the center hosted the 95th Annual Kansas Transportation Engineering conference that attracted more than 500 participants.

Graduate student Brandon Bortz was named the student of the year and was recognized for this achievement at the Transportation Research Board annual meeting in Washington D.C.

Mid-America Transportation Center

K-State CE is a partner in the Mid-America Transportation Center (MATC), a Region 7 University Transportation Center of the U.S. Department of Transportation. The center is a consortium of five universities – the University of Nebraska-Lincoln, Kansas State University, the University of Kansas, Missouri University of Science and Technology, and the University of Iowa. In 2012, Iowa State University and the University of Missouri also joined this consortium. MATC projects at K-State are administered by Professor Mustaque Hossain who serves as an associate director of the center.

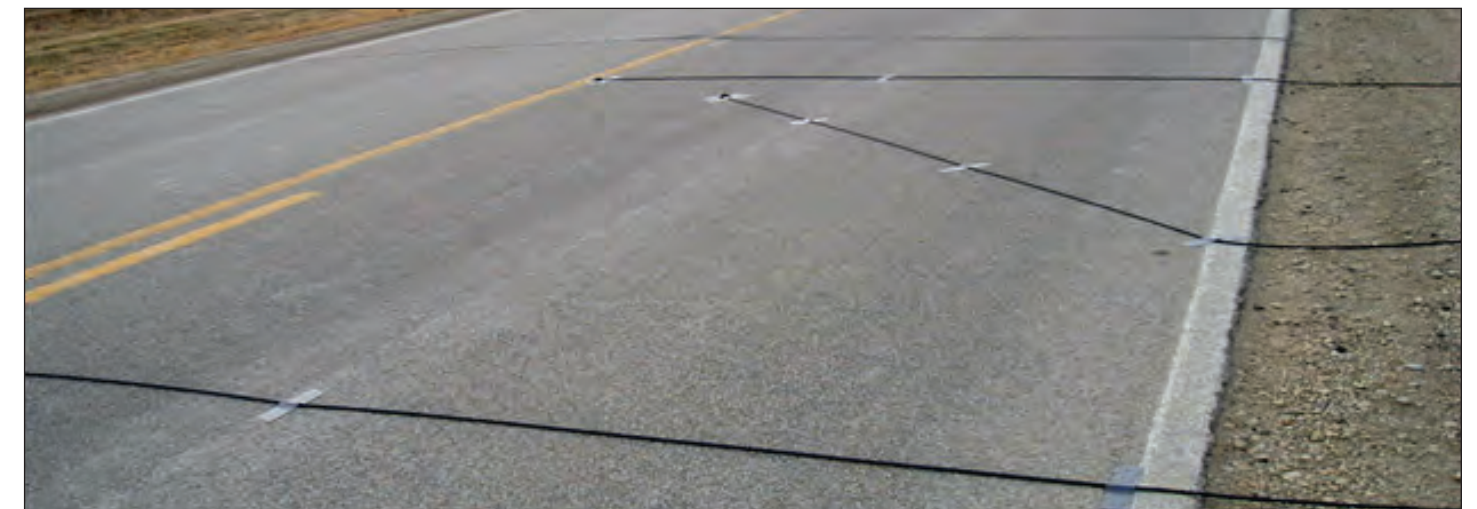
K-State MATC work concentrates on the preservation and safety of our regional transportation infrastructure due to increased truck loads resulting from freight movements. The USDOT strategic goals of “state of good repair” and “safety” were the predominant goals. Professor Sunanda Dissanayake worked on safety and Professors Hossain and Peterman

worked, respectively, on pavements and structural issues. Professor Peterman continued his work on railroads. Professor Kyle Riding has started as a new investigator. His project is on durable concrete pavement repair materials. Professor Ken Klabunde from the department of chemistry has teamed up with Iowa State University to derive asphalt binder additives from bio-fuel production wastes. That project delves into “environmental sustainability” and “economic competitiveness” strategic goals of USDOT.

Several presentations were based on the MATC-sponsored research projects. Professor Dissanayake presented a paper titled “Identification of Characteristics and Severity Analysis of Large Truck Crashes Using Binary Logit Model” at the Mid-Continent Transportation Research Forum, Sept. 6–7, 2012, Madison, Wisconsin. The paper was also published in the proceedings. MATC-supported graduate student Nassim Sabahfar is scheduled to present her master's research at the 2013 ASCE Highway and Airfield Pavement Conference in June in Los Angeles, Calif.

A number of graduate students supported by MATC have received their degrees. Two students have received their master's degrees and one has received a Ph.D. degree. One of the master's graduates has continued her doctoral studies at K-State. MATC-KSU has also supported a number of summer and academic year interns. A new minority internship program has also been started.

The MATC technology transfer projects at K-State were very successful as well. MATC was a sponsor of the Annual Kansas Transportation Engineering Conference in April 2012, which was very well attended. Three four-day Superpave training classes, in February and March of 2012, were also offered by K-State. These certificate classes had about 61 participants. A two-day workshop on “Thin Surface Treatments for Bituminous Pavements” was held on the K-State Olathe campus. Thirty five state, local government and industry people participated in that event. Professors Dissanayake, Hossain and Peterman each participated in the inaugural MATC Webinar series.



Projects

Environmental Engineering

The Role of Dust on Snow and Other Aeolian Inputs in Soil Formation and Biogeochemical Cycling in Barren, Alpine Catchments

P.I.: Natalie Mladenov; Co-P.I.s: Williams, Schmidt, and Blum
National Science Foundation, \$556,774, 2010-2014

The combination of increasing temperatures and dust emissions, melting glaciers and surprisingly high amounts of microbial activity in recently deglaciated soils represent a new connectivity between geologic, biological and hydrologic processes in barren, alpine catchments. This project evaluates the provenance and chemical quality of aeolian deposition and investigates initial phases of weathering and biogeochemical cycling in barren, high-elevation soils using novel spectroscopic techniques, stable isotope and cation analyses, soil chemistry and mineralogy analyses, and bioavailability experiments. Hypotheses are being tested in the Green Lakes Four catchment of the Colorado Front Range, where aeolian deposition, soil microbial processes and nitrification, which have been studied independently over the last few decades, are being studied as interacting processes in an interdisciplinary investigation.

REU Site: Sustainable Production and Processing Systems for Biomass-Derived Fuels of the Future

P.I.: Alok Bhandari; Co-P.I.s: Raj Raman and Michelle Soupir
National Science Foundation, \$312,000, 2010-2013

Biomass-derived fuels are a promising source of renewable energy with a potential to reduce energy imports while decreasing atmospheric emissions of fossil-fuel-derived CO₂. This project focuses on (i) educating the next generation of scientists and engineers about biomass-derived fuel production, (ii) training them to conduct high-quality scientific research and (iii) inspiring them to pursue graduate education. The REU site is hosted at Iowa State University. Each year, 10 participants are recruited and matched with one of five specific project areas based on their academic background and interests. Students spend 10 summer weeks on campus working on hypothesis-driven project topics contributed by nine faculty researchers who closely mentor and supervise each student's research. Other enrichment activities include technical and professional seminars, field trips, attendance at an international conference, group meetings and work sessions, and a five-hour ethics workshop. Project success is measured through qualitative and quantitative assessments conducted by the PIs in collaboration with specialists in education research.

Enhanced Gas-Liquid Mass Transfer Using Magnetite Nanoparticles

P.I.: Alexander Mathews

National Science Foundation, \$311,287, 2010-2012

Nanoparticles and mesoporous nanoshells possess unique properties such as high surface area and mobility, and these can be used to advantage in changing bubble properties in gas-liquid mass transfer. This project investigates methods and mechanisms to enhance gas-liquid mass transfer and reaction rates using nanoparticles and nanoshells as shuttles. This process can provide a several-fold increase in mass transfer rates due to (1) a parallel liquid-solid-gas transfer mechanism in addition to liquid-gas mass transfer, (2) increased bubble residence time and (3) cavitating bubbles under ultrasonic fields. The project is examining the mechanisms by which inert and adsorbent nanoparticles affect mass transfer rates in the transfer of dissolved organic contaminants from water to the air phase in the presence and absence of ultrasonic fields. Results of this work promise to provide more efficient means of conducting mass transfer operations in drinking water purification, multiphase reactions in the process industries, and in the removal of volatile organic compounds from contaminated ground water and wastewaters.

Geotechnical Engineering

Characterizing KDOT's Chloride Permeability Testing Protocol: Reducing the Duration of Rapid Chloride Permeability Test

P.I.: Yacoub Najjar

KSU University Transportation Center, \$90,000, 2008-2012

Reliable and economical design of Portland cement concrete (PCC) pavement structural systems relies on various factors, among which is the proper characterization of the expected permeability response of the concrete mixes. For characterization of the permeability response of PCC pavement structure, the Kansas Department of Transportation (KDOT) uses the rapid chloride permeability test to determine the resistance of concrete to penetration of chloride ions, as well as the boil test to determine the percent of voids in hardened concrete. In this project, back propagation artificial neural network (ANN)-based and regression-based permeability response prediction models for rapid chloride and boil tests are being developed in order to reduce or eliminate the duration of the testing period. Comparison of the prediction accuracy of the developed ANN models and regression models show that ANN models outperform the regression-based models. The ANN-based permeability prediction models being developed from this research appear to be efficient in characterizing the permeability response of concrete mixes used in transportation applications.

Structural Engineering

KSU_RC Upgrade for Performance and Capacity Assessment of RC Bridge Piers Considering New K-DOT LRFD Provisions and Plastic-Hinge Length

P.I.: Asad Esmaily; Co-P.I.: Hayder Rasheed

Kansas Department of Transportation, \$58,240, 2010-2012

State DOTs are expected to use the new AASHTO LRFD bridge design code. This project addresses K-DOT's need and provides the analytical tools necessary for a realistic performance assessment of bridge piers under various loading conditions. A displacement-controlled analysis procedure is used for performance assessment. Virtual analysis is conducted using the KSU_RC as the analytical tool to perform moment curvature and force deflection. The program has been benchmarked against experimental data from a number of reinforced concrete bridge columns under a wide range of loading patterns, including non-proportional axial load and cyclic lateral displacement.

FRP Bridge Deck Panels

P.I.: Hani Melhem

KSU University Transportation Center, \$36,500, 2010-2012

AASHTO provides load distribution factors for determining how much load a longitudinal beam supporting a bridge deck should be designed to hold. Since fiber-reinforced polymer (FRP) is a relatively new material used for bridge design, there are no provisions in the AASHTO specifications that provide a load distribution when designing beams supporting an FRP deck. In this project, FRP honeycomb, or FRPH, hollow-core deck panels, are being loaded and analyzed to provide information about a conservative load distribution that will assist engineers in future bridge designs with FRPH decks. Two support conditions are being evaluated: continuous panel supported by four beams and a simply supported panel with cantilever on one side. Strain gauges are

mounted at mid-span of each beam. Conservative design factors are being determined through data analysis for the FRPH deck.

EAGER: Engineered Bio-Composites for Sustainable Concrete

P.I.: Hayder Rasheed; Co-P.I.s: Dunja Peric and Larry Davis

National Science Foundation, \$30,000, 2010-2012

Special attention is needed for more durable construction that requires less frequent and less expensive maintenance of highway infrastructure while utilizing materials whose use is sustainable. This project investigates incorporation of agricultural wastes to enhance the behavior of concrete. Renewable agricultural waste material is abundantly available as co-products of biofuel processing. This project is determining the optimum proportions of cellulose fibers and lignin that can sustain the performance of concrete under short-term loading. Lignin acts as a water reducer to control the water-cement ratio and improve strength and durability. Wheat fiber, on the other hand, acts as a micro-cracking barrier controlling the microstructure crack growth under early age and fatigue conditions. This project is focused on combining both bio-based materials in reinforcing cement concrete.

Transportation and Materials Engineering

Effects of Geometric Design Features on Truck Crashes on Limited-Access Highways

P.I.: Sunanda Dissanayake

Mid-America Transportation Center, \$54,601, 2010-2012

Greater amounts of freight are being transported by trucks, causing the number and percentage of trucks on the national highway system to increase significantly. Trucks are larger in size and weight and typically have different performance characteristics than passenger vehicles. Safe operation of these large trucks is a major concern as they disproportionately account for traffic fatalities. When trucks are involved in crashes with other smaller vehicles, the majority of fatalities involve the occupants of the



other motor vehicle. A better understanding of the impact of geometric design features of highways on truck crashes can bring significant benefits. This project evaluates truck crashes in detail by developing models to determine the influence of various geometric design features, traffic and other characteristics of large-truck crash occurrence on limited-access roadways.

KSU University Transportation Center

P.I.: Robert Stokes

U.S. Department of Transportation, \$198,229, 2010-2012

The goal of this project is to recruit and retain highly qualified students in programs of study that advance the mission of the K-State UTC. Project funds are also used to provide travel assistance for students to participate in conferences and workshops. Candidates for the UTC Scholarship and Assistantship Program are nominated by a member of the UTC faculty. The scholarship and assistantship awards are typically on the order \$5,000/semester, depending on availability of funds.

A Review of K-DOT Overhead Guide Sign Lighting Policy

P.I. Margaret Rys; Co-P.I.s Andre Rys and Eugene Russell
Kansas Department of Transportation, \$89,000, 2010-2012

The goal of this project is to determine the minimum retro-reflectivity levels for the overhead guide signs that will satisfy FHWA requirements and be consistent with minimizing life-cycle costs. It includes a study of the cost and safety benefits of using different retro-reflective sheeting versus external lighting for the overhead guide signs, and the most cost-effective means of external illumination considering the life-cycle costs of newer, lower energy systems.

Kansas Pavement Preservation Initiative: Development of a Seal Coat Design and Construction Manual and Investigation of Design of Seal Coats with Lightweight Aggregates

P.I.: Mustaque Hossain; Co-P.I.: Dean Testa

U.S. Department of Transportation, \$129,967, 2008-2012

Current seal and coat design methods used for preservation of asphalt pavements were designed for regular aggregates. K-DOT exclusively uses lightweight aggregates for asphalt pavement design. There have been recent problems in Kansas and lightweight aggregates have been blamed for these. Almost no information is available on seal coats with lightweight aggregates, necessitating the investigation for lightweight aggregates. This project includes the development of a one-day training class and a seal coat design manual for KDOT, and evaluation of the use of lightweight aggregates in chip seal in Kansas.

BRIGE: Linking the Microstructure, Performance and Sustainability of Mixed-Glass Cullet-Blended Cements

P.I.: Kyle Riding

National Science Foundation, \$174,999, 2010-2012

Mixed-glass cullet is most often landfilled because of the difficulty and expense in recycling heterogeneous glass particles into new container glass. This material, however, has the potential to improve concrete properties while replacing millions of tons of cement in concrete each year with a corresponding reduction in greenhouse gas emissions. This project utilizes microstructural and thermodynamic modeling to predict the reactivity of mixed-glass cullet particles in concrete. Results from this research are providing a rational, materials science-based approach for optimizing mixed-glass cullet performance in concrete for precast applications and ultra-high performance concrete, which are usually cured at varying and elevated temperatures.

Water Resources Engineering

Hyper-Extractive Economies and Sustainability: Policy Scenarios for Sustainable Water Use in the High Plains Aquifer

P.I.: David Steward; Co-P.I.s: Joseph Aistrup, Laszlo Kulcsar, Jeffrey Peterson, Steve Welch

National Science Foundation, \$1,499,000, 2009-2012

Southwest Kansas sits on the Ogallala Aquifer, one of world's largest underground sources of freshwater, which is also quickly becoming a depleted natural resource. Hyper-extractive practices produce economic and resource path dependencies, which when placed in relation with global processes such as international migration and the emergence of global commodity chains, shape future patterns of population growth and economic development. This project focuses on investigating changes in the parameters of irrigated agriculture that will produce sustainable uses of the aquifer without jeopardizing the region's economy. To model this system, researchers are using an integrated, cross-disciplinary, system-level theoretical approach that links land and water use patterns, economic trends and population dynamics to issues of sustainability. The project focuses on 1) accurately modeling the current hyper-extractive system; 2) forecasting the outcome of possible policy approaches to transition the current system toward possible paths that are more sustainable for the social, economic and natural systems of the groundwater-based economies of the High Plains Aquifer; and 3) communicating the model's outcomes to stakeholders and policy makers for the purpose of developing legislation to implement policy changes designed to enhance sustainability. Involvement of researchers, educators, students, elected leaders and stakeholders ensures development of a healthy dialogue about the possibility of changing policy to implement some combination of reforms to enhance regional sustainability.

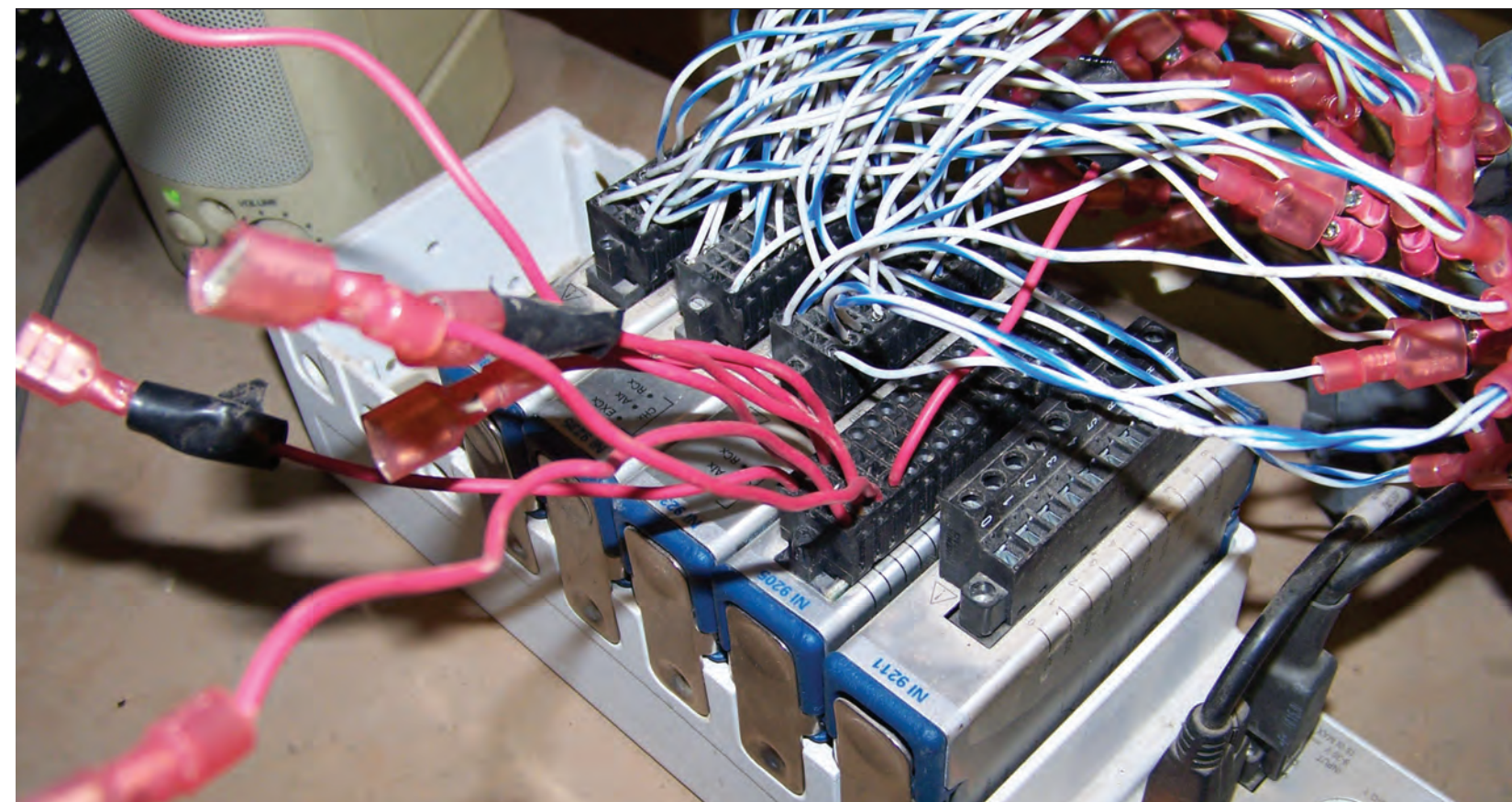
Environmental Engineering

- Performance and Acceptance of Denitrification Bioreactors for Agricultural Drainage. Pre-Doctoral Fellowship Grant, U.S. Department of Agriculture National Institute of Food and Agriculture. Christianson, L.; Helmers, M.; Bhandari, A. \$40,000, 2011-2012 (at Iowa State U).
- Occurrence and Movement of Antibiotic-Resistant Bacteria and Resistance Genes in Tile-Drained Agricultural Fields Receiving Swine Manure Application. National Pork Board. Bhandari, A.; Soupir, M.; Moorman, T. \$30,000, 2011-2012 (at Iowa State U).
- REU Site: Sustainable Production and Processing Systems for Biomass-Derived Fuels of the Future. National Science Foundation. Bhandari, A.; Raman, D.R.; Soupir, M. \$312,000, 2010-2013 (at Iowa State U).
- REU Site: Bridging the Diversity Gap: Research Experiences in the Geosciences for Community College Students and Transfers. Tim, U.; Kaleita A.; and Bhandari A. National Science Foundation, \$150,000, 2010-2012 (at Iowa State U).
- Enhanced Gas-Liquid Mass Transfer Using Magnetite Nanoparticles. National Science Foundation. Mathews, A. P. \$311,287, 2009-2012.

- The Role of Dust on Snow and Other Aeolian Inputs in Soil Formation and Biogeochemical Cycling in Barren, Alpine Catchments. National Science Foundation, Mladenov, N.; Williams, Schmidt, and Blum. \$556,774, 2011-2014.
- International Planning Visit: Investigating the Interactions Between Dissolved Organic Matter, Microbial Communities, and Arsenic Biogeochemistry in Groundwater of a Pristine Delta. National Science Foundation, Mladenov, N. \$19,943, 2011-2012.
- REU Enhancement of Gas-Liquid Mass Transfer Using Magnetite Nanoparticles. National Science Foundation. Mathews, A. Awarded in 2012: \$12,200.
- ECE International Planning Visit: Investigating the Interactions Between Dissolved Organic Matter, Microbial Communities, and Arsenic Biogeochemistry in Groundwater of a Pristine Delt. National Science Foundation. Mladenov, N. Awarded in 2012: \$12,710.

Geotechnical Engineering

- Characterizing KDOT's Chloride Permeability Testing Protocol: Reducing the Duration of the Rapid Chloride Permeability Test. KSU University Transportation Center. Najjar, Y. \$139,124, 2008-2012.



Grants

- Knowledge Discovery in Transportation Databases (KDiTD). KSU University Transportation Center. **Najjar, Y., Perić, D., and Dissanayake, S.** \$208,124, 2007-2013.
- Towards Sustainable Pavements: Engineered Agricultural Waste for Alleviation of Thermal Cracking, Phase I. KSU University Transportation Center. **Perić, D. and Rasheed, H. A.** \$15,000, 2010-2012.

Structural Engineering

- KSU_RC Upgrade for Performance and Capacity Assessment of RC Bridge Piers Considering the New K-DOT LRFD Provisions and the Plastic-Hinge Length. Kansas Department of Transportation. **Esmaily, A. and Rasheed, H.** \$40,000, 2010-2012.
- Innovative Systems of FRP Bridge Deck Panels with Crash-Worthy Guardrails. KSU University Transportation Center. **Melhem, H.** \$36,500, 2010-2012.
- Developing Short-Span Alternatives to Reinforced Concrete Box Culvert Structures in Kansas. Kansas Department of Transportation. **Peterman, R. J.** \$75,000, 2011-2012.
- Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties. Federal Rail Administration, CXT Concrete Ties, Inc., and KSU University Transportation Center, **Peterman, R. J., Beck, B. T., and Wu, C. H.** \$1,091,540, 2011-2013.
- Determining the Transfer Length in Prestressed Concrete Railroad Ties Produced in the United States. Mid-America Transportation Center. **Peterman, R. J.** \$55,835, 2011-2012.
- Long-Term Monitoring of a Pretensioned Concrete Bridge Near Winfield, Kan. Kansas Department of Transportation. **Peterman, R. J.** \$19,343, 2011-2012.
- Amelia Earhart Bridge— Evaluating Long-Term Monitoring of Time-Dependent Characteristics. Kansas Department of Transportation. **Peterman R. J. and Esmaily A.** \$80,650, 2009-2013.
- LRFD Software for Design and Actual Ultimate Capacity of Confined Rectangular Columns: Phase 2. Kansas Department of Transportation. **Rasheed, H.A. and Esmaily, A.** \$59,900, 2010-2012.
- EAGER: Engineered Bio-Composites for Sustainable Concrete. National Science Foundation. **Rasheed, H. A., Perić, D., and Davis, L.** \$30,000, 2010-2012.
- LRFD Software for Design and Actual Ultimate Capacity of Confined Rectangular Columns: Phase 2. Kansas Department of Transportation and KSU University Transportation Center. **Rasheed, H. A. and Esmaily, A.** \$68,900, 2010-2012.

- Amelia Earhart Bridge—Evaluating Long-Term Monitoring of Time-Dependent Characteristics. Kansas Department of Transportation. **Esmaily A., Peterman R.** Awarded in 2012: \$12,800.
- Quantifying the Effect of Prestressing Steel and Concrete Variables on the Transfer Length in Pretensioned Concrete Crossties. Federal Rail Administration, CXT Concrete Ties, Inc., and KSU University Transportation Center. **Peterman, R.** Awarded in 2012: \$159,769.00.
- ECE Sustainable and Durable Bridge Decks (Phase 1). Kansas Department of Transportation. **Peterman, R.** Awarded in 2012: \$93,923.
- KDOT Column Expert: FRP Confinement of Square and Slightly Rectangular Concrete Columns Originally Confined with Steel Ties. Kansas Department of Transportation. **Rasheed, H.** Awarded in 2012: \$48,000.

Transportation and Materials Engineering

- Effects of Geometric Design Features on Truck Crashes on Limited-Access Highways. Mid-America Transportation Center. **Dissanayake, S.,** \$54,512, 2010-2012.
- Characteristics and Contributory Causes Related to Large Truck Crashes (Phase II). Mid-America Transportation Center. **Dissanayake, S.** \$47,900, 2009-2012.
- Keeping Vehicles on the Roadway in Rural Areas: Analysis of Run-Off-the-Road Crashes. KSU University Transportation Center. **Dissanayake, Rys, M. S., Russell, E., and Stokes, R.** \$119,972, 2009-2013.
- Rural Transportation Initiative Supporting Agricultural Transition and Sustainability. KSU University Transportation Center. **Dissanayake, S., Apley, M. D., Steward, D. R., and White, B. J.** \$50,000, 2006-2012.
- Traffic Assistance Services for Kansas Program (TASK). Kansas Department of Transportation, **Stokes, R.W., Mulinazzi, T., and Berges, L.** \$100,000, 2012.
- A Review of KDOT Overhead Guide Sign Lighting Policy. Kansas Department of Transportation. **Rys, M., Rys, A. and Russell, E.** \$89,000, 2010-2012.
- Accommodating Oversized/Overweight Vehicles at Roundabouts. **Russell, E. and Landman, E.D.** Eight-State Pooled Fund Project, \$338,300, 2010-2012.
- Evaluation of Bypass Lane Safety, Operations, and Design in Kansas. Kansas Department of Transportation K-TRAN program. **Dissanayake, S.** Awarded in 2012: \$79,000.
- Evaluation of Low-Cost Intersection Countermeasures to Reduce Red Light Running Violations. U.S. Department of Transportation, Mid-America Transportation Center. **Dissanayake, S.** Awarded in 2012: \$60,917.

- Phase II: Optimizing the Analysis of Routing Superloads/ OSOWs to Sustain Efficient Corridors. Kansas Department of Transportation. **Russell, E.** Awarded in 2012: \$59,000.
- A Study to Mitigate Rural and Urban High-Speed Horizontal Curve Crashes in Kansas. Kansas Department of Transportation. **Russell, E.** Awarded in 2012: \$79,000.
- Traffic Assistance Services for Kansas (TASK). Kansas Department of Transportation. **Stokes, R.** Awarded in 2012: \$70,000.
- Diverse Transportation Workforce Development Initiative. Task 2. University of Nebraska, Mid-America Transportation Center. **Stokes, R.** Awarded in 2012: \$20,581.
- Transportation Workforce Development Initiative FY13, Task 3. University of Nebraska, Mid-America Transportation Center. **Stokes, R.** Awarded in 2012: \$58,894.
- Use of High-Volume Reclaimed Asphalt Pavement (RAP) for Asphalt Pavement Rehabilitation Due to Increased Highway Truck Traffic from Freight Transportation. Mid-America Transportation Center. **Hossain, M.** \$44,782, 2010-2012.
- Transportation Workforce Development Initiative. Mid-America Transportation Center. **Hossain, M.** \$33,041, 2010-2012.
- KSU MATC Technology Transfer Program. Mid-America Transportation Center. **Hossain, M.,** \$35,973, 2010-2012.
- Assessment of General Aviation Airports in Kansas. Kansas Department of Transportation. **Hossain, M.** \$82,000, 2008-2012.
- Kansas Pavement Preservation Initiative: Development of a Seal Coat Design and Construction Manual and Investigation of Design of Seal Coats with Lightweight Aggregates. U.S. Department of Transportation. **Hossain, M. and Testa, D.** \$129,967, 2008- 2012.
- Kansas Pavement Preservation Initiative: Rehabilitation of Ultrathin Bonded Bituminous Surface. U.S. Department of Transportation. **Hossain, M. and Testa, D.** \$67,866, 2008-2012.
- Accelerated Pavement Testing of Paved Low-Volume Roads with Geocell Reinforcement. U.S. Department of Transportation. **Hossain M.** \$286,000, 2009-2012.
- Durable Superpave (SM and SR) Mixes in Kansas. Kansas Department of Transportation. **Hossain, M.** \$38,000, 2011-2013.
- Accelerated Testing of Paved Roads with Geosynthetics-Reinforced Base. Tencate Geosynthetics. **Hossain, M. and Najjar, Y.** \$197,367, 2011-2012.
- Sustainable and Durable Concrete Pavement Aggregates. Kansas Department of Transportation. **Riding, K. A.** \$49,000, 2012-2013.



- Determination of Acceptance Criteria for Prestressing Strand in Pretensioned Applications. Precast/Prestressed Concrete Institute. **Riding, K. A., Peterman, R. J., and Murray, L.** \$295,530, 2011-2014.
- Carbon Emissions and Energy Efficiency (Phase 2): Improving Energy and Fuel Efficiencies in KDOT Operations. Kansas Department of Transportation. **Riding, K. A., Stokes, R.W., and Keen, J.** \$60,000, 2011-2012.
- Evaluation of Concrete Strength and Permeability. Kansas Department of Transportation. **Riding, K. A.** \$174,000, 2010-2012.
- Measurement of the Pore-Size Distribution of Limestone Aggregates in Concrete Pavement Cores. Kansas Department of Transportation. **Riding, K. A.** \$11,700, 2011-2012.
- Kansas Sustainable Concrete Pavements Initiative – Potential Use of Nanotechnology. Kansas Department of Transportation. **Riding, K. A.** \$38,945, 2010-2012.
- Effect of Y-Cracking on CRCP Performance. Oklahoma Department of Transportation. **Riding, K. A.** \$44,998, 2010-2012.
- Kansas Sustainable Concrete Pavements Initiative. Kansas Department of Transportation. **Riding, K. A.** \$43,500, 2010-2012.
- BRIGE: Linking the Microstructure, Performance, and Sustainability of Mixed-Glass Cullet-Blended Cements. National Science Foundation. **Riding, K. A.** \$174,999, 2010-2012.



- Collaborative Research: New Natural Supplementary Cementitious Materials for Concrete. National Science Foundation. **Riding, K. A.** \$210,618, 2010-2013.
- Evaluation of Canadian Unconfined Aggregate Freeze-Thaw Tests for Identifying Nondurable Aggregates. Kansas Department of Transportation. **Riding, K. A.** and **Hossain, M.** \$12,250, 2009-2012.
- Administration of KDOT/KTRAN Program 2007. Kansas Department of Transportation KTRAN Program. **Hossain, M.** Expenditures in 2012: \$18,248.53. Awarded in 2012: \$20,000.
- Accelerated Testing of Paved Roads, CISL #18. TENCATE. **Hossain, M.** Awarded in 2012: \$122,771.
- Consortium of Accelerated Pavement Testors CISL #19. U.S. Department of Transportation. **Hossain, M.** Awarded in 2012: \$178,875.00.
- Durable Superpave (SM and SR) Mixes in Kansas. Kansas Department of Transportation. **Hossain, M.** Awarded in 2012: \$38,000.
- Well Bonded Superpave Overlays on HMA (CISL #17). Kansas Department of Transportation. **Hossain, M.** Awarded in 2012: \$134,099.
- KSU-MATC Technology Transfer Program, Task 1. Mid-America Transportation Center. **Hossain, M.** Awarded in 2012: \$65,228.
- PER eval of Superpave SR mixtures containing RAP from surface recycling. Kansas Department of Transportation. **Hossain, M.** Awarded in 2012: \$74,108.
- Minimum Virgin Binder Limits in Recycled Superpave (SR) Mixes in Kansas. Kansas Department of Transportation. **Hossain, M.** Awarded in 2012: \$72,000.
- Accelerated Testing of Paved Roads with Geosynthetic-Reinforced Base (CISL #18), Match for BG2999, was GECE002309. TENCATE. **Hossain, M.** Expenditures in 2012: \$14,174.43. Awarded in 2012: \$11,785.
- ECE Sustainable and Durable Concrete Pavement Aggregates. Kansas Department of Transportation. **Riding, K.** Awarded in 2012: \$49,000.
- Implementation of Alternatives to Asphalt Concrete Subbases for Concrete pavement. Texas Tech University. **Riding, K.** Awarded in 2012: \$9,300.
- Effect of Y-Cracking on CRCP Performance (PS-14) (Year 2). Oklahoma State University. **Riding, K.** Awarded in 2012: \$14,998.00
- Evaluation of Bonding Agent Application on Concrete Patch Performance, Task 6. University of Nebraska, Mid-America Transportation Center. **Riding, K.** Awarded in 2012: \$59,999.
- Freeze-Thaw Performance of Concrete Railroad Ties (FRA). FRA. **Riding, K.** Awarded in 2012: \$609,016.
- Air Void Clustering. Kansas Department of Transportation. **Riding, K.** Expenditures in 2012: \$226.96. Awarded in 2012: \$66,000.

Water Resources Engineering

- MRI: Acquisition of a Hybrid GPU Computing Cluster High-End Applications in Science and Engineering. National Science Foundation. **Andresen, D., Caragea, D., Esry, B., Steward, D. R., and Dodds, W.** \$700,000, 2011-2014.
- Hyper-Extractive Economies and Sustainability: Policy Scenarios for Sustainable Water Use in the High Plains Aquifer. National Science Foundation. **Steward, D. R., Aistrup, J. A., Kulcsar, L., Peterson, J. M., and Welch, S. M.** \$1,499,999, 2009-2012.

Alok Bhandari

- Fellow, American Society of Civil Engineers (ASCE)
- Member, Association of Environmental Engineering and Science Professors (AEESP)
- Member, American Society of Engineering Education (ASEE)
- Member, Water Environment Federation
- Member, Kansas Society of Professional Engineers (KSPE)
- Member, Sigma Xi
- ASCE Environmental and Water Resources Institute, Environmental Council Awards Committee
- AEESP Education Committee
- AEESP Demographics and Diversity Committee
- KSPE Membership Committee
- Board Member, KSPE Tri-Valley Chapter
- Associate editor, Journal of Hazardous, Toxic and Radioactive Waste Management
- Director, K-State Urban Water Institute
- Dr. Robert Snell Civil Engineering Alumni Professorship

Sunanda Dissanayake

- Member, ASCE
- Member, Institute of Transportation Engineers
- Member, Kansas Association for Uniform Traffic Control
- Member, Chi Epsilon Honor Society
- Member, Fulbright Peer Review Committee for Senior Scholar Grants
- Member, ASCE, Transportation and Development Institute (TDI) Local Roads and Streets Committee

- Member, ASCE, TDI Transportation Safety Committee
- Member, Transportation Research Board (TRB), Vehicle User Characteristics Committee
- Associate editor, Journal of Transportation Safety and Security
- Member, Kansas Department of Transportation (K-DOT), Kansas Transportation and New Development (K-TRAN) Technical Committee
- Member, K-DOT, K-TRAN Transportation Operations Panel
- Member, K-DOT, K-TRAN Local Governments Panel
- Editorial board member, Journal of Advances in Transportation Studies
- Member, KSU Faculty Senate
- Coffman Leadership Fellow

Asad Esmaeily

- Member, ASCE
- Member, Engineers without Borders Kansas Professional Chapter
- Member, ASCE-American Concrete Institute (ACI) Joint Committee on Reinforced Concrete Columns
- Chair, ASCE-Engineering Mechanics Institute (EMI) Experimental Analysis and Instrumentation Committee
- Member, Technical and Scientific Organizing Committee, 13th International Conference on Nonconventional Materials and Technologies, Changsha, Hunan, China.
- Associate editor, Journal of Bridge Engineering
- Guest editor, Journal of Engineering Mechanics – Special Issue on Experimental Methods in Damage Detection and Wind Engineering
- KSU College of Engineering, Meyers-Alford Teaching Excellence Award



Service and recognition

Mustaque Hossain

- Friend, TRB, Flexible Pavement Design Committee
- Member, TRB, Committee on Strength and Deformation Characteristics on Pavement Management
- Friend, TRB, Asset Management Committee
- University representative, TRB
- Chair, ASCE Committee on Highway Construction
- Associate director, Mid-America Transportation Center
- Past president, ASCE Kansas Section
- Member, KDOT, K-TRAN Pavement Panel
- Member, KDOT, K-TRAN Technical Committee
- KSU, Munger Professorship in Civil Engineering
- KSU Civil Engineering, ASCE Student Chapter Outstanding Faculty Award
- KSU Civil Engineering, Outstanding Academic and Professional Service Award
- Training organizer, Superpave Field Lab Technician Certification Training, KSU
- Organizer, Workshop on Thin Surface Treatments for Bituminous Pavements, Kansas State University-Olathe

Natalie Mladenov

- Member, AEESP
- Member, ASCE
- Member, American Geophysical Union (AGU)
- Member, Association for the Science of Limnology and Oceanography
- Member, Tau Beta Pi Engineering Honor Society
- Member, American Association of University Women
- KSU representative, Consortium of Universities for the Advancement of Hydrologic Science

Alexander Mathews

- Member, Examining Committee, National Council of Examiners for Engineering and Surveying
- Member, Separations Division, American Institute of Chemical Engineers

Hani Melhem

- Fellow, ASCE
- Member, ASCE Council for Computing and Information Technology
- Member, ASCE-American Concrete Institute (ACI) Joint Committee on Pre-Stressed Concrete
- Organizer, Kansas Bridge Workshop
- KSU Civil Engineering, Outstanding University and Professional Service Award
- Conference organizer, 18th Annual Kansas Bridge Design Workshop, Kansas State University

Yacoub Najjar

- Member, ASCE
- TRB, Committee on Modeling for the Design, Construction, and Management of Geosystems
- Board member, Innovations Conference on Asphalt and Transportation, Bradley University
- Associate editor, International Journal of Geomechanics
- Associate editor, Computers and Geotechnics
- Member, Planning Committee, Kansas Geotechnical Engineering Conference
- Thomas and Connie Paulson Civil Engineering Outstanding Faculty Award
- KSU Civil Engineering, ASCE Student Chapter Advisor of the Year Award
- KSU Civil Engineering, Chi Epsilon Chapter Undergraduate Outstanding Teaching Award

Dunja Perić

- Member, ASCE
- Member, ISSMGE
- Visiting Fellow, University of New South Wales, Sydney, Australia
- Associate editor, Journal of Geotechnical and Geoenvironmental Engineering

Robert Peterman

- Member, ASCE
- Member, Precast/Prestressed Concrete Institute (PCI)
- Secretary, PCI Prestressing Steel Committee
- PCI, Bridge Committee
- PCI, Strand Bond Task Force
- PCI, Journal Advisory Committee
- TRB, Committee of Dynamics and Field Testing of Bridges
- Keynote speaker, 2011 Annual PCI Conference
- KSU, Martin K. Eby Distinguished Professorship in Engineering
- KSU Civil Engineering, Outstanding Research Award

Hayder Rasheed

- Fellow, ASCE
- Member, American Concrete Institute (ACI)
- Task group chair, ACI Committee on Fiber-Reinforced Polymer Reinforcement
- ACI, Composite and Hybrid Structures Committee
- Associate editor, International Journal of Structural Stability
- Associate editor, Open Journal of Computational Mechanics
- KSU Civil Engineering, Outstanding Graduate Faculty Award
- KSU Civil Engineering, Outstanding Teaching Award

Kyle Riding

- Member, ASCE
- Member, ACI
- Member, American Ceramic Society (ACerC)
- ACI, Wason Medal for Materials Research
- Secretary, ACI Committee on Properties of Concrete at Early Ages
- Secretary, ACerC Cements Division
- Member, ACI, Committee on Durability of Concrete
- Member, ACI, Committee on Material Science of Concrete
- Associate editor, Journal of Materials in Civil Engineering
- Vice president, ACI Kansas Chapter

Eugene Russell

- Life member, American Railroad Engineering and Maintenance of Way Association
- Member emeritus, AREMA Committee 24 Education
- Life member, National Association of County Engineers
- Honorary member, Kansas County Highway Association
- Fellow and life member, American Society of Civil Engineers
- Fellow and life member, Institute of Transportation Engineers
- Member emeritus, TRB Highway-Rail Grade Crossing Committee
- Associate member, Sigma Xi
- Member, Transportation Research Forum
- Member, Association of Pedestrian and Bicycle Professionals
- Member, Canadian Society of Civil Engineers
- Member, Transportation Association of Canada
- Member, TAC Roundabout Committee
- Chair, TRB Roundabouts Committee
- Member, TRB System Safety Users Group
- Member, NCHRP Panel 3-78B Roundabout and Turn Lane Solutions for the Visually Impaired
- Member, Academy of Civil Engineers, Missouri University of Science and Technology
- Member, Chi Epsilon
- Honor member, Chi Epsilon Missouri S&T Chapter
- Member, ASCE Safety Committee
- Member, ASCE Low-Volume Roads Committee
- Member, ITE Roundabout Committee
- Member, ITE Grade Crossing Committee
- Member, ITE Missouri Valley Chapter
- Member, ASCE Kansas Section

Steven Starrett

- Member, ASEE
- Member, American Academy of Water Resource Engineers (AAWRE)

- Member, Governing Board, National Treasurer, EWRI-ASCE
- Executive board member, National Institute of Engineering Ethics
- Chair, Nominations Committee, National Institute of Engineering Ethics
- Member, ASCE Committee on Ethics in Practice
- Member, ASCE Watershed Management Technical Committee
- Editorial board member, ASCE Leadership and Management in Engineering publication
- Member, International Center for Academic Integrity

David Steward

- Member, ASCE (American Society of Civil Engineers)
- Member, AGU (American Geophysical Union)
- Member, EGU (European Geosciences Union)
- Member, IAHS (International Association of Hydrological Sciences)
- KSU representative, CUAHSI (Consortium of Universities for the Advancement of Hydrologic Science)
- KSU representative, UCOWR (Universities Council on Water Resources)
- Member, Advisory Committee, Urban Water Institute
- Member, Technical Committee, 6th International Conference on the Analytic Element Method
- Panel review member, National Science Foundation
- Invited Plenary Session Talk, Midwest Ground Water Conference
- Invited Talk, 3rd Water Resources Conference, Helmholtz Institute, Berlin
- Invited Talk, University of Nebraska Water Seminar Series
- KSU Chi Epsilon, Undergraduate Teaching Excellence Award

Robert Stokes

- Executive committee member, Council of University Transportation Centers
- Fellow, ASCE
- Fellow, ITE
- Co-director, K-DOT-KSU-University of Kansas (KU), Traffic Assistance Services for Kansas Program
- Board member, KU Local Technical Assistant Program
- Director, Kansas Transportation Engineering Conference
- Director, K-State University Transportation Center
- Conference organizer, Annual Transportation Engineering Conference, Kansas State University
- Workshop organizer, Traffic Assistance Services of Kansas, Kansas State University, the University of Kansas and K-DOT



K-State CE offers comprehensive programs leading to the degrees master of science and doctor of philosophy in civil engineering. Graduate students work with their committees to create personalized graduate programs of study in specializations such as environmental engineering, geotechnical engineering, materials engineering, structural engineering, transportation engineering and water resources engineering. An active research program is conducted in each of these areas, and it is the goal of the department to maintain a close connection among graduate study, research, teaching and engineering practice. In 2012, 71 students were enrolled in K-State CE graduate programs. Twenty-nine M.S. degrees and two Ph.D. degrees were awarded.

Students admitted for work toward an M.S. degree select a program of study requiring completion of a master's thesis or a master's report within their area of interest. Students supported on research projects are typically expected to complete a thesis. Students admitted for work toward a Ph.D. degree are required to develop an original research program, and complete a doctoral dissertation under the guidance of a program of study committee made up of faculty members from CE and other departments.

K-State CE also offers a graduate certificate program in transportation engineering. Graduate students majoring in any specialization can earn this certification after completing 12 credit hours of course work required for the certificate.

The primary requirement for admission to the CE graduate program is the receipt of a B.S. degree from a civil engineering undergraduate program accredited by the Accreditation Board of Engineering and Technology (ABET) or considered equivalent to an ABET-accredited program. For international programs, Kansas State University reserves the right to make the determination whether a civil engineering program is equivalent to an ABET-accredited undergraduate program in the United States. Students not possessing an undergraduate degree in civil engineering may be admitted if their undergraduate program is closely related to a specific specialty in civil engineering, and they complete the necessary deficiencies in their subject of specialization.

A valuable source of information about the CE graduate programs is the Graduate Handbook published by the department and accessible at the following website: www.ce.ksu.edu/grad.



In the next decade, another billion people will be added to the earth's population. This growth creates enormous demands for infrastructure to produce energy, transport people and goods, dispose wastes, clean the environment, and construct living and working spaces. Skills of civil engineers will, as always, be central to meeting these demands.

Civil engineering is the engineering of constructed facilities and systems: buildings, bridges, tunnels, dams, harbors, airports, waterways, highways, hydropower, irrigation, water supply, wastewater treatment and environmental health systems. As a rule, if a facility is one-of-a-kind, large and important in the daily lives of many people, chances are civil engineers participated in the planning, design and construction of that facility.

The K-State CE undergraduate program is fully accredited by the Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology (ABET). Students enrolling in the bachelor of science program in civil engineering must successfully complete 128 credit hours of required courses in

the curriculum. The CE program offers students the opportunity to pursue one of five curriculum tracks: general civil engineering, construction engineering, environmental engineering, structural engineering and transportation/materials engineering. In 2012, the department enrolled 305 students and awarded 47 B.S. degrees. CE undergraduate students received 49 scholarship awards worth \$120,000.

Extracurricular opportunities include the ASCE student chapter, the Institute of Transportation Engineers student chapter, the Chi Epsilon honorary and the Women in Civil Engineering organization. Students enthusiastically participate in competition teams such as the concrete canoe and steel bridge teams. The K-State CE steel bridge team routinely ranks among the top teams in the regional competition and made its eighth consecutive appearance in the national competition in 2012. Student performance in the Fundamentals of Engineering test has been very good with our pass percentage for the October 2012 FE exam being 68%, compared to the national pass rate of 64%.

Advisory Council

The mission of the council is to provide a continuing liaison between the academic community and practicing profession, and to assist the CE department, College of Engineering and Kansas State University in providing the highest quality of civil engineering education.

Functions of the council are to review programs and goals, and advise the department head and dean of the college.

Goals and objectives of the civil engineering advisory council include the following:

- coordinating with the department to stay informed about its needs;
- consulting and assisting the department head and faculty on departmental curricula, including instructional and organizational matters;
- presenting information on needs and services of the department to interested parties;
- assisting in the collection of case studies and problem materials for educational purposes;
- assisting in the process of faculty recruitment and faculty-industry interaction;
- assisting the department in developing research and technology transfer;
- assisting with ABET accreditation; and
- providing support to students and faculty through engagement in department and classroom activities.

John H. Ahern

Vice-President – Engineering
EvapTech, Inc.
Lenexa, Kan.

Greg Allison

VP Civil Engineering
MKEC Engineering
Consultants, Inc.
Wichita, Kan.

Darold Davis

Senior Project Manager
Garver
Tulsa, Okla.

Larry W. Emig

Retired Engineer
KDOT
Topeka, Kan.

Brad Fagan

Schwab Eaton PA
Manhattan, Kan.

Gregg Greenwood

Professional Engineering
Consultants P.A.
Wichita, Kan.

Jeff Hancock

SMH Consultants PA
Manhattan, Kan.

Gary Janzen

City Engineer/
Assistant Director
Dept. of Public Works
and Utilities
Wichita, Kan.

Catherine M. Patrick

Director of Operations
KDOT
Topeka, Kan.

Cathy S. Ritter

President
Constellation Design
Group, Inc.
Timonium, Md.

Karla S. Waters

Project Manager
Wilson & Company, Inc.
Salina, Kan.

Jerry Westhoff

President
JJ Westhoff Construction
Company
Lincoln, Neb.

Contact information

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Mustaque Hossain	Professor	Fiedler 2124	785-532-1576	mustak@ksu.edu
Alexander Mathews	Professor	Fiedler 2131	785-532-1582	alex@ksu.edu
Ryan McGrath	Instructor	Fiedler 2109	785-532-0889	rdmcgrath@ksu.edu
Hani Melhem	Professor	Fiedler 2127	785-532-1584	melhem@ksu.edu
Natalie Mladenov	Assistant Professor	Fiedler 2122	785-532-0885	mladenov@ksu.edu
Dunja Perić	Associate Professor	Fiedler 2108	785-532-7612	peric@ksu.edu
Robert Peterman	Professor	Fiedler 2113	785-532-7612	bob@ksu.edu
Eugene Russell	Emeritus Professor	Fiedler 2133	785-532-1588	geno@ksu.edu
Hayder Rasheed	Associate Professor	Fiedler 2126	785-532-1589	hayder@ksu.edu
Kyle Riding	Assistant Professor	Fiedler 2107	785-532-1578	riding@ksu.edu
Steven Starrett	Associate Professor	Fiedler 2132	785-532-1583	steveks@ksu.edu
David Steward	Professor	Fiedler 2129	785-532-1585	steward@ksu.edu



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