MATC: Improving Safety and Minimizing Risk Associated with Increasing Multi-modal Freight Movements
I am pleased to present our MATC Annual Report for 2008-2009. MATC has had another very successful year as the U.S. Department of Transportation’s Region VII University Transportation Center, as you will see in the accompanying articles. The theme of our center – “improving safety and minimizing risk associated with increasing multi-modal freight movement on the U.S. surface transportation system,” – is evident throughout our many research, education, and technology-transfer activities. As a group we have continued to meet the goals of the USDOT’s Research and Innovative Technology Administration (RITA) and we continue to focus on regional issues with substantive participation from our world-class academic partners located in each state of Region VII.

The major initiatives undertaken this year by each MATC partner – University of Nebraska, Kansas State University, University of Kansas, University of Iowa, and the Missouri University of Science and Technology – are described in separate sections dedicated to each institution. Furthermore, we have developed meaningful and significant research and education initiatives with Prairie View A&M University (PVAMU) and Lincoln University (LU). I am particularly appreciative of the important contributions of Dr. Judy Perkins at PVAMU and Dr. Ty Westergaard at LU in helping us reach our goals.

MATC has continued to expand already-extensive relationships among transportation stakeholders in Region VII. I would like to take the opportunity to congratulate Dick McReynolds on his recent retirement as Engineer of Research for the Kansas Department of Transportation and to thank him for his dedicated service to MATC. We welcome Dick’s replacement, Rodney Montney, to our executive committee. MATC is fortunate to have each of our region’s state transportation agency research heads serving as active members of our advisory board along with significant federal, state and private sector participants from all surface transportation modes.

I would also like to welcome two new advisory board members to MATC: Dick Reiser and Monty Fredrickson. Dick is a member of the Nebraska Highway Commission and is Executive Vice President and General Counsel of Werner Enterprises, Inc., which is a top ten trucking and logistics firm. Monty Fredrickson was recently named Director of the Nebraska Department of Roads and brings a wealth of experience to the table. I am confident that Rod, Dick and Monty will greatly enhance our MATC activities and I look forward to working with them in the coming years.

In this annual report you find stories related to our successful research, education and technology-transfer programs. As always, the year’s successes would not have been possible without the continued support from our public and private sector partners, along with the university principal investigators who run our research programs. Most importantly, I would like to acknowledge our students who are the lifeblood of our program, as you will see in our education articles. In keeping with the goals of the UTC program, our dedicated researchers continue to support undergraduate and graduate education. For example, over eighty students have participated in our thirty-four research projects in the four states of Region VII. I am always impressed by the quality of undergraduate and graduate students who participate in MATC activities – we are fortunate to work with such talented students.

In closing, I would like to say that we have made great progress in building one of the pre-eminent UTCs in the country and I am excited by the possibilities in the coming year. I welcome your feedback and suggestions and encourage you to check our website or contact us if you have any questions. Thank you for your interest and continued support.

Sincerely,
Larry
Vision
MATC’s vision is to become a nationally recognized center of transportation excellence focused on developing new knowledge, innovative solutions, and the next generation of transportation professionals necessary to sustain the U.S. transportation system in a manner that is safer, more effective, more efficient, environmentally friendly, and sustainable.

Philosophy
MATC is designed as a true partnership between the Iowa Department of Transportation (IdOT), the Kansas Department of Transportation (KDOT), the Missouri Department of Transportation (MoDOT), the Nebraska Department of Roads (NDOR), the United States Department of Transportation (USDOT), private and public sector transportation representatives, and the member institutions of the Region VII UTC consortium. MATC is a cooperative effort among the major transportation sector partners in Region VII.

Overview of Consortium Members
Because each consortium member brings unique expertise and resources to MATC, the collective MATC program is greater than the sum of its individual programs. For example, the five state flagship universities—UNL, KU, MS&T and UI have all established nationally recognized transportation programs and facilities. The laboratories, equipment, computer resources, faculty support, quality of students, and administrative support mechanisms are typically the highest quality available. MATC faculty are committed to increasing the diversity of the nation’s transportation workforce and is proud to partner with LU, the leading minority-serving institution in Region VII. Faculty from each consortium member university are nationally and internationally known for their research related to the multi-modal transportation system.

This unique combination of resources and faculty allows MATC to succeed in meeting the programs and goals envisioned in the SAFETEA-LU UTC legislation. Because of MATC’s underlying partnership agreement, faculty and students in Region VII have unprecedented access to state-of-the-art laboratories, computer resources, and administrative support, thereby enabling MATC researchers to develop multi-institutional, interdisciplinary research teams to attack and solve the complex transportation problems faced by Region VII and the nation.

University of Nebraska—Lincoln (UNL)
The University of Nebraska–Lincoln (UNL) is the primary research and doctoral degree-granting institution in Nebraska. As Nebraska’s land-grant university, it serves as the flagship institution of the University of Nebraska system. UNL has extensive experience in federal- and non-federal-sponsored research, as evidenced by its annual submission and receipt of grants in excess of $50 million.

The primary conduit for transportation research at UNL is the recently created Nebraska Transportation Center (NTC). The NTC, which is headquartered at UNL, serves as the umbrella organization for surface transportation-related research, education, and technology transfer programs on all four University of Nebraska campuses (Omaha, Lincoln, Kearney, and the Medical Center). These programs include the Midwest Roadside Safety Facility, Mid-America Transportation Center, and the Nebraska Technology Transfer Center on the Lincoln Campus; the UNL Center for Infrastructure Research and the UNO School of Public Administration on the Omaha Campus, and the Nebraska Safety Center at University of Nebraska located in Kearney. The Health Education, Rural Health, and Traffic Injury Prevention and Acute Treatment Programs are located in the NU Medical Center.

University of Kansas (KU)
The University of Kansas (KU) fosters cross-disciplinary research in emerging transportation issues that have broad significance. Campus researchers and graduate students participate in research across related disciplines with colleagues from other universities and public transportation entities.

Faculty researchers at the University of Kansas conduct research on a variety of transportation topics, such as 1) new component and system technologies that advance vehicular and transportation systems, 2) the development of a new generation of vehicles, with improved energy efficiencies and lowered pollutant emissions, increased safety and durability, 3) the planning and development of new tools to design, model, and analyze components, transportation systems and environmental impacts, and 4) the provision of advanced-technology educational research experiences through undergraduate and graduate programs, interaction with industrial partners, and outreach activities to state and regional groups.

Missouri University of Science and Technology (MS&T)
The Department of Civil, Architectural, and Environmental Engineering at the Missouri University of Science and Technology (MS&T) (formerly University of Missouri-Rolla) has a broad-based program with seven emphasis areas, including structures, geotechnical engineering, construction, materials, transportation, environmental engineering, and hydrodynamics. The MS&T research activities related to infrastructure engineering and intelligent systems are coordinated by several research centers. The Center for Infrastructure Engineering Studies (CIIES), plays a significant role in the execution of initiatives within transportation infrastructural areas.

The primary research areas developed over the years include advanced materials and their application for existing structure rehabilitation, load test bridge assessment, nondestructive evaluation, and the monitoring of technologies of civil infrastructure. MS&T has developed research infrastructures for several of the proposed research theme topics, including a three-story tall structures testing laboratory that allows for the testing of full-scale structural members and systems, a structural health monitoring laboratory, a material testing laboratory, a nondestructive testing laboratory, and a network simulation laboratory.
Kansas State University (KSU)

Kansas State University (KSU) has all the facilities necessary for the successful completion of a wide range of transportation research projects, offering some of the best facilities in the nation for research related to the transportation infrastructure. These facilities include a full-scale, indoor accelerated pavement testing facility, two state-of-the-art Superpave Laboratory, a falling weight deflectionmeter (FWD) calibration laboratory, and various other structural testing capabilities.

University of Iowa (UI)

The University of Iowa (UI) brings a number of important research groups to the MATC consortium. UI’s Public Policy Center (PPC) was formed in 1987 to provide interdisciplinary research on public policy issues. Research teams at PPC address a number of important policy areas including transportation, health care, human factors and vehicle safety, economic development, social equity, and environmental quality. UI is also home to the National Advanced Driving Simulator—the most advanced driving simulator in the world. Developed by the National Highway Traffic Safety Administration (NHTSA), it is used to conduct research that will ultimately reduce the loss of lives and property on the nation’s roadways.

Lincoln University (LU)

Lincoln University (LU), located in Jefferson, Missouri, has strong programs in business, finance, and accounting and has requested that education be the focus of their participation in MATC. As the only historically black college and university (HBCU) in Region VII, UI’s participation is critical to the success of the education and transfer components of the MATC program.

Prairie View A&M University (PVAMU)

Prairie View A&M University (PVAMU) was founded in 1876 and is the second-oldest public institution of higher education in Texas. PVAMU is recognized for its reputation for producing engineers, nurses, and educators and offers baccalaureate degrees in 90 academic majors, 17 master’s degrees, and 4 doctoral degree programs through 9 colleges and schools. Member of the Texas A&M University System, the university is dedicated to fulfilling its land-grant mission of achieving excellence in teaching, research, economic development, social equity, and environmental quality.

Transportation-Related Research Programs

The five flagship universities (UNL, KSU, KU, UI, and MS&T) all have significant existing transportation-related research programs that include centers dedicated to roadside safety (UNL), infrastructure testing (UNL, KSU, KU, and MS&T), advanced highway materials (KSU), technical assistance programs (MS&T, UNL, KU), driving simulation (UI, UNL), public policy (UI), and advanced vehicle and fuel technologies (MS&T, UI, UNL). Highlights of these are listed below.

Unil

University Transportation Center Mid-America Transportation Center Local Technical Assistance Program

KSU

University Transportation Center Center for Transportation Training and Research

KU

Center for Infrastructure Engineering Studies University Transportation Center Natural Hazards Mitigation Institute Intelligent Systems Center

MS&T

Center for Infrastructure Engineering Studies

UI

National Advanced Driving Simulator Public Policy Center Iowa Institute of Hydraulic Research Construction Materials Laboratory Engineering Research Laboratory Human Factors and Statistical Modeling Laboratory Hank Driving Simulator Operator Performance Laboratory

Institutional Resources

The member institutions that comprise the consortium, particularly, the five flagship universities (UNL, KSU, KU, UI, and MS&T) have excellent facilities and significant resources that are used in MATC activities. Combined budgets of the research, service, and educational activities of the consortium members exceed tens of millions of dollars annually. More importantly, the synergy that exists among the consortium’s transportation faculty and researchers is leading to greater national achievements in research, education, and service than could have been accomplished if the consortium members were to work as single entities.

The combined lab and equipment resources of the MATC consortium members are substantial. Major research libraries, state-of-the-art computer facilities, laboratories, and office space are available in adequate quantities at each university. The institutional members of MATC have a substantial array of classrooms, offices, and support services available for use by MATC personnel. All universities in the consortium have state-of-the-art training and video-conferencing facilities that are capable of meeting the needs of all research and training (both on-site and distance learning) initiatives.

MATC has access to a comprehensive set of multi-modal, state-of-the-art research and testing facilities. These include the Nebraska Transportation Center’s (NTC) Intelligent Transportation Systems Laboratory (UNL), the NTC Midwest Roadside Safety Facility (UNL), several structural testing facilities (UNL, MS&T, KU, KSU), an Accelerated Pavement Testing Facility (KU), the National Advanced Driving Simulator (UI), and an environmental testing facility (KU). A wide range of research already has been conducted at these facilities and the sponsors include various public (FHWA, FRA, NDOR, IaDOT, RDOT, MoDOT) and private agencies (NASA, Indy Racing League).

Highlights of the institutional resources of MATC’s consortium members are shown in the following table.

UNL

NTC Intelligent Transportation Systems Lab

NTC At-Grade Railway Test Bed

NTC Midwest Roadside Testing Facility

Structural Laboratory - Lincoln

Peter Kiewit Institute’s Structural Laboratory – Omaha

KSU

Accelerated Pavement Testing Facility

Falling Weight Deflectometer Calibration Lab

Superpave Laboratory and Advanced Asphalt Laboratory

Structural Engineering Laboratory

KU

Structural Engineering and Materials Lab

Geotechnical Testing Lab

Traffic Safety Lab

Intelligent Systems and Automation lab

Energy Research Center

MS&T

Highway Structures Laboratory

Applied Microwave Nondestructive Testing Laboratory

Trustworthy Systems Laboratory

Structural Health Monitoring Laboratory

UI

National Advanced Driving Simulator
Dr. Elizabeth "Libby" Jones
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Associate Director, Mid-America Transportation Center
University of Nebraska-Lincoln
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Omaha, NE 68182-0178
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Dr. Libby Jones is an associate professor in the Department of Civil Engineering at the University of Nebraska-Lincoln (Omaha campus). She directs and oversees the MATC Intelligent Transportation Systems Lab at the University of Nebraska’s Peter Kiewit Institute. Dr. Jones has been a principal investigator or co-principal investigator on more than 15 research projects. She has authored or co-authored over 20 journal papers and served as committee chair for over 20 master’s and PhD students. Currently she is supervising five master’s students and two PhD students. Dr. Jones serves as the MATC Associate Director for UNL.

Dr. Genda Chen
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Associate Director, Mid-America Transportation Center
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Dr. Genda Chen is a professor in the Department of Civil, Architectural, and Environmental Engineering at the Missouri University of Science & Technology (formerly, University of Missouri-Rolla) and the interim director of the Center for Infrastructure Engineering Studies (CIES). He is a registered professional engineer in the state of California. Dr. Chen has been principal investigator and co-principal investigator on over 55 research projects, totaling more than $8 million for his teams and approximately $3 million for his share. He has supervised 11 doctoral students and 13 master’s students, and has published over 40 peer-reviewed journal papers and an additional 125 conference papers. Dr. Chen will serve as the MATC Associate Director for the Missouri University of Science & Technology.

Dr. Mustaque Hossain
Professor, Civil Engineering
Associate Director, Mid-America Transportation Center
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Dr. Mustaque Hossain is a professor in the Department of Civil Engineering at Kansas State University. His main areas of interest include the application of new technologies in construction, quality control/quality assurance, mechanistic analysis and design of pavements, non destructive testing of pavements, and pavement and maintenance management systems. Dr. Hossain has conducted over 50 research projects, published over 44 peer-reviewed journal articles and has four patents related to his research. He is a fellow of the American Society of Civil Engineers (ASCE) and is also very active in the Transportation Research Board (TRB). He serves as the MATC Associate Director for Kansas State University.

Dr. Paul Hanley
Assistant Professor, Civil & Environmental Engineering and Public Policy Center
Associate Director, Mid-America Transportation Center
University of Iowa
218 South Quad
Iowa City, IA 52242
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Dr. Paul Hanley is an associate professor of transportation in civil and environmental engineering as well as in urban and regional planning at the University of Iowa. He also has an appointment at the University’s Public Policy Center, where he is the director of transportation policy research. His principal research interests are transportation engineering, planning, and economic policy analysis. In general, his work focuses on assessing the impacts of policy changes on transportation behavior and on infrastructure provision as a means of enhancing safety, ensuring economic welfare, and promoting sustainable urban patterns. He will serve as the MATC Associate Director for the University of Iowa.

Dr. Tom Mulinazzi
Professor, Civil, Environmental and Architectural Engineering
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Dr. Tom Mulinazzi is a professor and former department chair of Civil Engineering and associate dean of Engineering at the University of Kansas (KU). He has been a member of the Kansas State Board of Technical Professions since 2000. He is very active with the Local Technical Assistance Program at KU. Dr. Mulinazzi will serve as the MATC Associate Director for the University of Kansas.
Mr. Dan Murray
Vice President, Research
American Transportation Research Institute
Mr. Murray is Vice President for Research for the American Transportation Research Institute (ATRI), an award-winning, not-for-profit research arm of the trucking industry that conducts objective research, analysis and evaluation on a range of transportation issues, such as safety, technology, productivity and security. Mr. Murray has overall responsibility for directing ATRI’s portfolio of research and has served as project manager on research initiatives sponsored by FHWA, FAA, FMCSA, USDOT, CPB TRB and TSA. In addition, he has served on various transportation research committees for organizations such as the National Academy of Sciences, General Accounting Office, and Council on Competitiveness. Prior to joining ATRI, Mr. Murray worked for the Regional Transit Board (Minneapolis/St. Paul) as Project Administrator. He also spent several years working in economic development for a Chicago-based Fortune 50 business consortium. Mr. Murray received his BA from Gustavus Adolphus College, and his MS degree from Northern Illinois University.

Mr. Mark Stiles
Senior Vice President
Trinity Industries Inc.
Mr. Stiles is Senior Vice President of Trinity Industries, Inc. a privately held publicly traded company. He is also the Group President and Chief Operating Officer of Trinity Industries. Trinity Industries is one of the nation’s largest transportation companies, with a focus on rail, marine and defense. The company operates through a number of well-known companies, including Trinity Rail Equipment Co., American Shipyards Inc., Marine Steel Fabricators, Inc., Hommas Industries, Inc., and Trinity Marine Service Co., Inc. Mr. Stiles joined Trinity in 1995, and prior to that he worked at the Trinity National Headquarters in Dallas, Texas. Mr. Stiles is a native Texan and a graduate of Trinity University in San Antonio, Texas. He received his Bachelor of Science degree in Engineering from Trinity University in 1992 and his Master of Business Administration degree from the University of Houston in 1995. He is a member of the Board of Directors of Trinity Industries, Inc. and a member of the Board of Directors of Trinity National Headquarters. Mr. Stiles is also a member of the Board of Directors of Trinity National Headquarters. Mr. Stiles is married and has two children. He currently resides in Dallas, Texas.

Mr. David Sehrt
Senior Vice President
Ingram Barge Lines
Mr. Sehrt is Senior Vice President of Ingram Barge Lines. Mr. Sehrt graduated with a BS in chemical engineering from Tulane University in 1976. In 1980, Mr. Sehrt received an MBA from the Owen School of Management at Vanderbilt University. Since 1980, he has been with Ingram Barge Company, working primarily in the motor vessel engineering and barge maintenance areas.

Mr. Robert VanderClute
Senior Vice President, Safety and Operations
Association of American Railroads
Mr. VanderClute is a Senior Vice President of the Association of American Railroads. His responsibilities include overseeing the association’s safety and operations programs. He joined the Association in 2001 as the Director of Safety and Compliance. Prior to joining the Association, Mr. VanderClute was responsible for the day-to-day operations of the company, including customer service, training, procurement and material management, safety, environmental, engineering, and mechanical service centers as well as other key corporate responsibilities. During his tenure, the company implemented a high-speed rail program, embarked on a six billion-dollar infrastructure improvement program, replaced virtually its entire locomotive and rail fleet, and became the largest contract carrier of commuter services in North America.

Mr. Ed Trout
Senior Vice President, Operations
President, Comair/Bee Line Motor Lines
Mr. Ed Trout is past chairman of the American Trucking Association and current President of Comair/Bee Line Motor Lines, which he had the opportunity to buy in 1988. Since 1998, Ed and his three sons, Joe, John, and Tom, have run the enormously successful family business. Ed also served as chairman of both the Nebraska Trucking Association and the American Trucking Association.
Mr. Monty Fredrickson
Director, State Engineer
Nebraska Department of Roads
Mr. Fredrickson was born and raised in Stromsburg, Nebraska. After graduating with a Bachelor's degree in Civil Engineering in 1989 from the University of Nebraska—Lincoln, he worked for Shell Oil Company as a mechanical engineer in New Orleans, Louisiana for two years. In 1990, he began working for the Nebraska Department of Roads and spent one year as a survey party chief and district engineer in the Omaha, Nebraska construction district. Mr. Fredrickson also spent seventeen years working in the Roadway Design Division in Lincoln, Nebraska, rising to the position of Assistant Design Engineer in the following areas: Rural, Urban, Expyrwy and Interstate. After four years as District Engineer in charge of construction and maintenance back in Omaha, he is currently in the 26th year as Deputy Director for Engineering Services in Lincoln, Nebraska.

Mr. Joseph Werning
Division Administrator
Federal Highway Administration Nebraska Division
Mr. Werning was appointed Division Administrator for the Federal Highway Administration’s Mid-America Transportation Center Personnel

Mr. Michael Flanigon
Director, Office of Safety and Security
Office of Program Management
Federal Transit Administration
Mr. Flanigon has been employed in the rail transportation industry for over 35 years. He began his career as a brake-man on the Southern Pacific Lines (SP). During his tenure with SP, he worked as a switchman, conductor, locomotive engineer, and operating rules instructor. He has also worked with the California Public Utilities Commission, where he had responsibilities in that state’s rail safety oversight program, and the Valley Transportation Authority, where he served as environmental health and safety manager and subsequently as light rail superintendent. Later, at San Francisco Bay Area Rapid Transit (BART), he served as the chief safety officer. He was an NTSB railroad accident investigator and served as the investigator-in-charge on a number of high profile railroad and transit accidents before joining the FTA in 2002 as the director of the Office of Technology. He earned his bachelor’s degree in anthropology from California State University, Los Angeles, and his master’s degree in public administration from Golden Gate University in San Francisco.

Dr. Ray Krammes
Technical Director, Research and Development
Turner-Fairbank Highway Research Center
Dr. Krammes has spent the last three decades establishing himself as one of the nation’s preeminent road geometric design scholars. Dr. Krammes, who holds a PhD in civil engineering from The Pennsylvania/Florida State University and is a registered professional engineer, has more than three dozen publication credits to his name and was recognized as the Federal Highway Administration’s Engineer of the Year in 2004. He is a member of the Institute of Transportation Engineers’ Transportation Safety Council.

Dr. Judy Perkins
Professor and Department Head
Department of Civil and Environmental Engineering
Prairie View A&M University
Dr. Perkins holds a BS, MS, and PhD in civil engineering from Southern University, University of Illinois (Urbana-Champaign), and Georgia Institute of Technology, respectively. At the master’s level, her area of specialty was in reinforced concrete structures; at the doctoral level, it was in transportation engineering. Since 1992, Dr. Perkins’ research has focused on statewide intermodal transportation planning, transportation logistics, evacuation analysis, and the impact of economic development as it relates to transportation. Moreover, Dr. Perkins has accumulated extensive experience in the development of survey design, data collection, and statistical analysis, and has held numerous professional positions with FHWA throughout the country and with a private engineering firm. He has extensive experience in the transportation field including, statewide and urban planning and programming, project development, environmental management, transportation finance, policy analysis, and legislative development. He has also received numerous performance awards, including the FHWA Administrator’s Award for Superior Achievement.

Region VII State Agency Research Directors

Mara Campbell
Organizational Results Director
Missouri Department of Transportation
Missouri is the organizational results director for the Missouri Department of Transportation (MoDOT). In this position she assumed June 2009. This unit is responsible for coordinating organizational performance efforts such as the development and monitoring of organizational performance measures and essential process and quality efforts coupled with innovative and applicable transportation research. The focus of the organizational results division is to close organizational performance gaps by implementing innovative transportation solutions.

Mrs. Campbell previously directed the department’s strategic planning and policy efforts. She has also served as a senior examiner with the Missouri Quality Award Program for the past four years and currently represents MoDOT on the Missouri Interagency Planning Council, AASHTO’s Standing Committee on Performance Management and Research Advisory Committee.

Mrs. Campbell joined MoDOT in 1997 as public affairs manager at MoDOT’s Central District office in Joplin City. In the past, she has also served as Missouri’s government affairs manager. Prior to joining MoDOT, Mrs. Campbell was the public relations and marketing director for Memorial Community Hospital/Capital Region Medical Center in Jefferson City.

Moe Jamshidi
Materials and Research Division Engineer
Nebraska Department of Roads
Mostafa Jamshidi is the Materials and Research Engineer for the State of Nebraska Department of Roads (NDOR). Mr. Jamshidi is currently responsible for directing all the research activities related to pavement design, pavement management and materials testing for the 10,000 Mile State Highway System of Nebraska. He is also in charge of coordinating all the research activities related to pavements and materials for the Nebraska Department of Roads. Mr. Jamshidi has been involved in the design and construction of transportation related projects. He has a graduate of the University of Nebraska with a PhD in Civil Engineering, and is a Registered Professional Engineer in the state of Nebraska. He is a member of the AASHTO’s Technical Committee on Materials, a member of AASHTO Research Advisory Committee, and the Transportation Research Board’s (TRB) representative for the NDOR.

Region VI State Agency Research Directors

Mr. Randy “Red” Montney
Engineer of Research
Kansas Department of Transportation
Rodney Montney is the engineer of research for the Kansas Department of Transportation (KDOT). In this position, he directs the agency’s research activities and 25 staff members. He serves as chairman of KDOT’s Research Technical Committee and secretary of its Research Program Council. Mr. Montney is a member of the AASHTO Standing Committee on Research (SCOR) and the AASHTO Research Advisory Committee (ORAC). He is also the Kansas DOT Transportation Research Board (TRB) representative. Mr. Montney serves on advisory committees for the University of Nebraska Mid-America Transportation Center and the Kansas State University Transportation Center. Mr. Montney has a B.S. in Mining Engineering from the Colorado School of Mines and is a Licensed Professional Engineer in the State of Kansas. He has worked for KDOT for 25 years. Prior to being appointed Engineer of Research, his experience has primarily been in construction, materials tests, pavement design, and concrete.
The Mid-America Transportation Center employs staff and students from the Nebraska Transportation Center on an as-needed hourly basis to ensure the most efficient use of MATC funds. The staff and students draw on a wide range of qualifications and areas of expertise and contribute greatly to the success of the center’s programs and to the quality of its publications.

Through their work on MATC projects, students engaged in such diverse majors as computer engineering, business, psychology, marketing, and English learn about transportation engineering and how it shapes the world while providing MATC with a talented, well-educated, and high-energy staff to complete the activities necessary for the center to thrive.
University of Nebraska-Lincoln Lead Institution Highlights at a Glance

In the past year MATC has continued our initiatives in transportation education to simultaneously recruit new students into the transportation field and expose them to multi-disciplinary issues by transportation professionals in academia and the public and private sectors.

Examples of activities conducted at UNL in furthering the MATC educational initiatives include:

• UNL Summer Intern Program: This year, fourteen undergraduate students participated at eight different organizations including the Nebraska Department of Roads, Iteris, Inc. and the University of Nebraska-Lincoln. For information about the program and their experiences this summer, see pages 51–53.

• Math and Science Professional Development Summer Institute & Engineering Experience Days: The summer institute was expanded this year to include a distance education component to reach additional teachers and students off of the UNL campus. Eighteen high school and junior high math, science, and industrial technology teachers participated and developed lesson plans. The final lesson plans will be made available to all teachers via website in the coming year. In the Engineering Experience Days, twenty-two selected students participated in test piloting the teachers’ lesson plans, as well as received tours with the teachers of the MwRSF crash test site, the Union Pacific Harriman Dispatch Center, and the Werner Enterprises distribution center. For more information about the summer institute, see pages 57-59.

• McMillan Middle School Student Visit: MATC graduate students and faculty had the opportunity to give over forty seventh grade students their first look into the world of transportation engineering. The students had a full day of lab tours, hands-on activities, faculty presentations, and a quiz bowl to test their knowledge. To read the full story, see pages 60-61.

The MATC Scholars Program (MATC SP) for Safety and Risk is planned for the 2010 summer semester. This program for graduate students is designed to attract U.S. students to the transportation field. Also in the upcoming year, we plan to have undergraduate and graduate courses in safety and system risk analysis. These courses will be multi-modal in nature and made available to students in the Region VII consortium through interactive, distance education methods. In addition, they will be integrated into the appropriate outreach activities to reach practicing engineers. Dr. Elizabeth “Libby” Jones expects to offer a course on railroad engineering in fall 2010 using distance education technology. Work still continues on the development of modules for existing classes that can be used for on-line instruction.
**UNL - MATC Students Working on Research**

**Nate Burnett, MS** Graduate Research Assistant, Civil Engineering  
*Project: Assessing the Risk of Crash for Trucks on Onset Yellow*

“The research project I am currently working on is assessing the risk of crash for trucks on onset yellow. The focus of this project is to enhance the safety of truck movements at high-speed signalized intersections. Since Nebraska is a major throughway for truck traffic, my research project will positively affect truck drivers throughout the state. This project has enhanced my critical thinking skills and introduced me to several new software packages.”

**Afzal Bushra, Ph. D** Graduate Research Assistant, Civil Engineering  
*Project: Computational Design Tool for Bridge Hydrodynamic Loading in Inundated Flows of Midwest Rivers*

“During a flood or tsunami, highway bridges over the sea or other waterways may become partially or completely submerged. Flooded flows add significant hydrodynamic loading on bridges, possibly resulting in the shearing or overturning of the bridge deck and failure of the bridge superstructures. The overall objective of my research effort is to establish validated computational practices to address the research needs of the transportation community in bridge hydraulics. A combined experimental and computational study of an inundated bridge is conducted to determine the drag, lift and moment coefficients on the bridge deck. The study showed that these coefficients in laboratory settings can be accurately predicted using commercially available CFD software with either k-ε model or a Large Eddy Simulation model. The research aims to transfer the recent supercomputer models of bridge inundation flows from laboratory scales to practical design scales and analyze the effects of scaling based on the geometric similarity and Froude number similarity law. The results of my research work will provide a tool for designing new bridges and retrofitting old ones so that we can build better and stronger bridges in the future which will be incorporated into U.S. Bridge design standards.”

**Miao Gao, MS** Graduate Research Assistant, Civil Engineering  
*Project: Truck Safety at Highway-Railroad Grade Crossings*

“The safety of the driver is always one of the most important concerns in transportation engineering. The topic I am working on, however, has received less attention by researchers so far, and I hope that the results of this project can help to improve the safety of Highway-Railroad Grade Crossings (HRGCs). In my research, I analyze the relationships between unsafe drivers’ maneuvers and relative factors statistically, based on field data collected over the years. The interpretation of this data analysis will then explicate the deficiencies of HRGC design, which will have to be improved in the future. This project has given me a chance to apply knowledge I have acquired during my one and half years as a graduate student. Furthermore, I have learned how to design a project and how to cooperate with other partners in a team.”

**Marta Lutomirska Wolinska, Ph.D.** Graduate Research Assistant, Civil Engineering  
*Project: Risk Mitigation for Highway and Railway Bridges*

“Reliability of highway and railway bridges strictly influences performance of the entire transportation network. An important part of the research is a selection of acceptability criteria for bridges, as well as the determination of an acceptable target risk level depending on the consequences and costs of structural failure. The results of this research will find their application in bridge management, allowing owners to evaluate existing structures and prioritize their repair or replacement.”

**Saohyok Im, Ph. D** Graduate Research Assistant, Civil Engineering  
*Project: Impact of Truck Loading on Design and Analysis of Asphaltic Pavement Structures*

“The purpose of this study is to investigate the truck load impact on pavement infrastructure and to develop a new and advanced tool for better design and analysis of pavement systems based on more accurate identification of damage and failure mechanisms than currently existing methods. This study compares analysis results from the newly-developed pavement design guide, the so-called Mechanistic Empirical Pavement Design Guide (MEPDG), to the results from the purely mechanistic approach based on the finite element method (FEM). Findings from this study are expected to produce direct insights for better implementation of the MEPDG into the design analysis of pavements.”

**Marek Kozikowski, Ph. D** Graduate Research Assistant, Civil Engineering  
*Project: Risk Mitigation for Highway and Railway Bridges*

“My main interest of study is the reliability of structures. Working on the project "Risk Mitigation for Highway and Railway Bridges" with Dr. Andrzej Nowak has helped me to expand my knowledge in the target risk analysis. Bridges as a part of the transportation network must have a sufficient level of safety, and the system reliability is the best way to determine the actual safety reserve.”

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**University of Nebraska–Lincoln Research Projects**

- Assessing the Risk of Crash for Trucks on Onset Yellow  
- Computational Design Tool for Bridge Hydrodynamic Loading in Inundated Flows of Midwest Rivers  
- Design of High Tension Cable Post Bases  
- Development of Advanced Finite Element Material Models for Cable Barrier Wire Rope  
- Impact of Truck Loading on Design and Analysis of Asphaltic Pavement Structures  
- Risk Mitigation for Highway and Railway Bridges  
- Truck Safety at Railroad Crossings  
- Study of RF Propagation Characteristics for Wireless Sensor Networks in Railroad Environments

Matching Funds Provided by:

- [NDOR](http://www.nebraska.gov)  
- [Nebraska](http://www.nebraska.gov)

For project details see pages 44-46
“Working on ‘Design of High Tension Cable Post Bases’ for Dr. Rohde was an enlightening experience. My task was to search the literature concerning the frost susceptibility in soils, which is not taught in classes. Frost heave has three major components that influence it: temperature, water, and soil type. I have found that during my research, to really understand a document, you need to read its sources and sometimes the sources’ sources. This can branch out very quickly and can become overwhelming. The project required me to work independently, keep myself focused, and set goals for when I wanted certain work to be completed. I enjoyed that I was in charge of my part of the research and that I could decide on its direction and boundaries. I also enjoyed that what I researched did not have a definitive answer to it, which made me realize that there will not always be a solution to every problem.”

Ling Zhu, Ph.D.
Graduate Research Assistant, Mechanical Engineering
Project: Design of High Tension Cable Post Bases

“Progress was achieved in the project of the new design of the high-tension cable post-footing. An initial footing design was proposed based on the worst-case impact scenario from the analytical calculation. In order to evaluate the design’s strength and deflection performances upon impact, bogie tests were conducted. Three different embedment depths (24 in., 36 in., and 60 in.) were tested in the soil. The 24-in. and 36-in. footings were rocked over without significant damages as expected, while the 60-in. footing was severely damaged upon impact. Though the design is already much stronger than all of the currently available designs, the longitudinal rebar and the straps in the footing were torn by the bogie impact. The bogie test results revealed that most of the current designs were insufficient to sustain the worst-case impact. The damage of the insufficient footing in these designs actually results in more maintenance cost instead of savings. Meanwhile, the impact load measured from the bogie tests appeared to be higher than what we expected. According to the measured load, a revised footing design has been completed, and more bogie tests are scheduled to evaluate the revised design. If the revised design passes the strength test, the cost will be evaluated to find out whether it is more economical to use the concrete footing in certain circumstances.”

Cody Stolle, M.S.
Graduate Research Assistant, Mechanical Engineering
Project: Development of Advanced Finite Element Material Models for Cable Barrier Wire Rope

“I have had the opportunity to experience the testing process in all phases, including planning the test setup and acquiring the data, designing test fixtures, considering static and dynamic effects, and then analyzing the data for use in modeling the cable. No other testing lab has conducted a test series designed to determine specifically physical properties of highway guardrail cable. The information extracted from this study will add to the transportation safety community’s understanding of the physical behavior of highway guardrail cable, and will result in a validated and accurate model for future simulation investigations. I have thoroughly enjoyed the different aspects of the testing process and found that it is useful to have experience in all of the fields to effectively plan and conduct the tests and to gather useful information.”

Puttipong Mahasukhon, Ph.D.
Graduate Research Assistant, Computer and Electronics Engineering Department
Project: Study of RF Propagation Characteristics for Wireless Sensor Networks in Railroad Environments

“I am currently working on developing comprehensive computer simulation models for our study of RF propagation characteristics in railroad multi-hop sensor networks. These models will be used to determine the parameters for WSN deployments to make them robust and provide high data throughput. I am also very excited to be participating in our planned field tests with Union Pacific Railway.”

Tao Ma, Ph.D.
Graduate Research Assistant, Computer and Electronics Engineering Department
Project: Study of RF Propagation Characteristics for Wireless Sensor Networks in Railroad Environments

“My work on this project focuses on implementing our own prototype communication system on actual wireless sensor nodes that we will use in our field tests with Union Pacific Railway. This implementation will utilize our RF propagation findings and incorporate them into a new WSN protocol. This is a great and unique learning experience for me.”

Sean Parks, M.S.
Graduate Research Assistant, Civil Engineering
Project: Design of High Tension Cable Post Bases

“‘The project required me to work independently, keep myself focused, and set goals for when I wanted certain work to be completed. I enjoyed that I was in charge of my part of the research and that I could decide on its direction and boundaries. I also enjoyed that what I researched did not have a definitive answer to it, which made me realize that there will not always be a solution to every problem.’
Throughout the last year, Kansas State University (KSU) has made considerable progress on the MATC projects for the 2008 fiscal year, as well as starting work on the approved FY 2009 research. Most of KSU’s research projects concentrate on the preservation and safety of our regional transportation infrastructure due to increased truck loads resulting from freight movements. The longevity of our transportation infrastructure is a major concern due to diminishing highway revenues and increased use. Thus, our effort is directed toward lengthening the lives of our transportation infrastructure elements. We are also looking at the safety aspects of increased truck traffic on our highways due to increased freight movements, and the effects of motor cycles in the mix. As part of the 2008 research program, I investigated how thin surface treatments such as the ultra-thin bonded bituminous surface (Nova chip) and modified slurry seal (micro-surfacing) can extend pavement life. After establishing the benefits and cost-effectiveness of micro-surfacing, we are now working on Novachip.

For the FY 2009 research program, I’m working on developing a design catalog for thin white topping on bituminous pavements.

Dr. Bob Peterman has been working on assessing the damage potential in pre-tensioned bridges caused by increased truck loads by accurately determining the stresses carried by in-situ bridge elements. The findings are expected to reduce the inherent risks associated with our deteriorating infrastructure. Dr. Sunanda Dissanayake has been investigating characteristics and contributory causes related to large truck crashes and motor cycle safety. Her work will recommend countermeasures and suggest focus areas needing particular attention to improve safety for all vehicles on the highway system.

Our MATC students continue to excel, too. Nishitha Bezawda, one of Dr. Dissanayake’s graduate students, won a $400 scholarship for a poster competition at the 2009 Midwestern District Institute of Transportation Engineers (ITE) Conference in Wisconsin Dells, WI. Steve Hammerschmidt, Dr. Peterman’s graduate student, has been awarded a scholarship by the K-State University Transportation Center, a Tier II UTC.

Overall, this past year has been a very productive one for MATC at KSU, and we look forward to continuing our collaboration with the other consortium partners in the future.
Also the driver, vehicle, and crash-related contributory causes of these factors in truck and non-truck crashes was performed. In addition to analyzing several characteristics that prevail in truck crashes, a comparative study of the predominance of six hours of core courses and an additional six hours of elective courses.

KSU MATC Education Program

Kansas State University, under sponsorship of MATC, has developed a Transportation Engineering Certificate program at KSU. This program will provide transportation professionals with the opportunity to pursue a focused collection of courses that, when completed, allows the student to receive recognition of their continued effort in the area of transportation engineering, or to accumulate credit hours toward their master’s degree. The objectives are (1) to prepare graduates for careers in transportation engineering, and (2) to expand the pool of qualified transportation engineering professionals with post-baccalaureate education. The program, offered online, consists of six hours of core courses and an additional six hours of elective courses.

KSU Tech Transfer Activities

KSU has also implemented several technology transfer projects under the sponsorship of MATC. In April 2009, KSU organized a session entitled “UTC Director’s Forum” at the Annual Kansas Transportation Engineering Conference that was very well attended. MATC Director and Keith W. Elaanwyer Chair in Engineering and Technology at UNL, Laurence Rietz, spoke at this session. This year KSU also offered two two-day training classes on thin surface treatments for bituminous pavements at two different locations in Kansas. More than forty people from industry, state and local governments, and academia attended. These four-day Superpave training classes were also offered by KSU. These classes attracted about sixty participants from the contractors, state and consulting companies. Future offerings of both classes are being planned.

KSU State MATC Students Working on Research

Nishitha Bezwada, MS
Graduate Research Assistant, Civil Engineering
Project: Characteristics and Contributory Causes Related to Large Truck Crashes (Phase D)

“In the course of this research project, Ms. Bezwada has contributed to the work on the fatal crash data procured from the Fatality Analysis Reporting System (FARS) over the past 12 months. In addition to analyzing several characteristics that prevail in case of truck crashes, a comparative study of the predominance of these factors in truck and non-truck crashes was performed. Also the driver, vehicle, and crash-related contributory causes are being analyzed using different statistical tools to get more productive results.”

Sharmi Sultana, M.S.
Graduate Research Assistant, Civil Engineering
Project: Extending Asphalt Pavement Life Using Thin Whitetopping

“Ms. Sharmi Sultana is a graduate research assistant working under the supervision of Dr. Mustaque Hossain. She is modeling thin whitetopping overlays over existing asphalt concrete pavements using the finite element software ANSYS. She is also comparing results obtained from the finite element analysis with the test data generated in an Accelerated Pavement Testing (APT) of a whitetopping project at Kansas State University. Her work is expected to result in a design catalog for thin whitetopping.”

Steven Hammerschmidt, M.S.
Graduate Research Assistant, Civil Engineering
Project: Assessing the Damage Potential in Pretensioned Bridges Caused by Increased Truck Loads Due to Freight Movements (Phase A)

“Mr. Hammerschmidt is working under the supervision of Dr. Robert Peterman’s supervision on the MATC research project “Assessing the Damage Potential in Pretensioned Bridges Caused by Increased Truck Loads Due to Freight Movements.” He received his bachelor’s degree from KSU in 2008 and is currently pursuing his master’s degree. Currently he is post-processing concrete columns, attaching strain gages to the member, coring around the strain gage, and then comparing the change in strain to the theoretical strain caused by the load. Mr. Hammerschmidt has enjoyed applying what he has learned in his undergraduate classes to his research and has learned the basic calculations and theories behind pretensioned concrete members over the past year.”

Mohammad Saad Bin Shaheed, M.S.
Graduate Research Assistant, Civil Engineering
Project: Improving Safety of the Surface Transportation System by Addressing the Issues of Vulnerable Road Users: Case of the Motorcyclists

“Mr. Mohammad Saad Bin Shaheed is a graduate research assistant working under the supervision of Dr. Sunanda Dissanayake. He started working on the MATC project “Improving Safety of the Surface Transportation System by Addressing the Issues of Vulnerable Road Users: Case of the Motorcyclists” in the spring of 2009. The study aims to investigate the characteristics of motorcycle crashes, identify critical characteristics, and evaluate the effect of helmet use on motorcycle injury outcome. Mr. Shaheed has completed a literature review of research on motorcycle crash characteristics and helmet use published in journals and reports. He has also collected data for the factors which may be related to motorcycle crashes for all the states. Currently he is developing a logistic regression model relating these factors and motorcycle fatalities to see how these factors contribute to an increase in the severity of motorcycle crashes.”

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The collaboration between the University of Iowa and the Mid-America Transportation Center (MATC) during FY 2009 has been productive and rewarding. Through MATC, researchers from the University of Iowa have been able to further the transportation community’s knowledge in the areas of commercial vehicle operations, freight safety, and materials. For example, Associate Professor Hosin Lee, Civil Engineering, completed a project that studied the reliability of warm mixed asphalt. He supported two graduate research assistants, which would not have been possible without funding from MATC. Assistant Professor Ratner of Mechanical Engineering completed phase II of a study on fire suppression in crashes involving diesel powered vehicles.

Also in FY2009, Associate Professor Boyle, Industrial Engineering, completed an examination of the factors related to the safety culture surrounding commercial vehicle operators. This project provided a unique opportunity for the University of Iowa to collaborate with the American Transportation Research Institute. The support by MATC made this collaboration and the funding of one graduate student possible.

Another project that was accepted in FY2009 will be conducted by Professor Fuller of Urban Planning and Economics. This project will examine ways to improve freight transportation through redundancy to cope with temporary interruptions of service. The University of Iowa has added two new classes to their offerings as part of MATC’s commitment to education. Professors James Stoter and Paul Hanley developed and taught “Public Transit Operations and Planning” in the spring of 2009. The enrollment was equally split between the Departments of Civil and Environmental Engineering and Urban and Regional Planning. The second course, “Freight Transportation Planning” has been developed by Professor John Fuller and Adjunct Professor Bart Cramer and is scheduled for fall 2009.

Associate Professors Boyle and Hanley continue to work alongside the Tier I UTCP, whose theme is “Transportation Safety through Improvements in Management Information Systems.” This unique opportunity to be a part of two transportation centers ensures that unique project ideas are centered on each UTCP theme. This has allowed us to connect researchers across campus from Urban Planning, and the Colleges of Business, Public Health and Engineering.

To summarize, this year has been a very positive experience for the University of Iowa, and we anticipate another successful year to come. The Iowa community looks forward to working with the University of Nebraska, University of Kansas, Kansas State University, and Missouri University of Science and Technology for many years.
University of Iowa MATC Students Working on Research

**Neeraj Mishra, M.S./Ph.D.**  
Graduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-Controlling Additives for Fire Mitigation

"From the testing of diesel and pure hydrocarbons, I have moved on to testing blends of these liquids with high molecular weight polymers. For the analysis of experimental observations, I have been learning the physics governing the flow of such non-Newtonian fluids. Use of software like Fluent for simulating drop impacts has also widened my capabilities and understanding in this field of fluid mechanics."

**Taleb Salameh, B.S./M.S.**  
Undergraduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-Controlling Additives for Fire Mitigation

"I have learned the importance of the experimental setup design so that repeatable data can be taken. I have also learned a lot about how droplets are studied and how fluid mechanics use non-dimensional parameters to model their behavior. This experience has taught me how engineering is applied to solve a given problem such as improving fire safety in the transport industry."

**Yan Zhang, M.S./Ph.D.**  
Graduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-Controlling Additives for Fire Mitigation

"I am a graduate research assistant under the supervision of Dr. Albert Ratner. While working on my project I have completed the calculations of the shear stress along a diesel engine fuel system. The experimental configuration is modeled in Fluent so as to enable comparison of real engine conditions to experimentally measured behavior. In future work, the model will be modified to include non-Newton fluid properties."

**Brian Sulak, B.S.**  
Undergraduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Assessment of the Effectiveness of Mist-controlling Additives in Mitigating Crash-Induced Diesel Fires

"During this year I have researched the mechanics of the diesel fuel engine and the flow of the fuel inside of this system. Once the pivotal points of the flow were determined, I learned how to model a droplet of diesel liquid using the programs Gambit and Fluent. The data from these simulations will help develop the correct mist-controlling polymer additive for future diesel fuels. My research has trained me to utilize the skills I gain from my education and apply them to a real project that will hopefully someday benefit the world. I am also pleased that this experience has given me the chance to apply my knowledge to a project that will eventually help others, which is what is really important to me."

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**Brian Sulak, B.S.**  
Undergraduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-Controlling Additives for Fire Mitigation

"I have learned the importance of the experimental setup design so that repeatable data can be taken. I have also learned a lot about how droplets are studied and how fluid mechanics use non-dimensional parameters to model their behavior. This experience has taught me how engineering is applied to solve a given problem such as improving fire safety in the transport industry."

**Taleb Salameh, B.S./M.S.**  
Undergraduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-Controlling Additives for Fire Mitigation

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Graduate Research Assistant, Mechanical Engineering  
Project: Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-Controlling Additives for Fire Mitigation

"I am a graduate research assistant under the supervision of Dr. Albert Ratner. While working on my project I have completed the calculations of the shear stress along a diesel engine fuel system. The experimental configuration is modeled in Fluent so as to enable comparison of real engine conditions to experimentally measured behavior. In future work, the model will be modified to include non-Newton fluid properties."

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Letter from the Associate Director - Dr. Tom Mulinazzi

Being a part of MATC has definitely helped to give the transportation program at the University of Kansas visibility in the CEAE Department. A new required junior level undergraduate course has been approved by the Department. The enrollment in our highway engineering course has increased from 10 to 28 in the past two years. More and more undergraduates are expressing an interest in the transportation field and more of our graduates are working in transportation.

MATC funds enabled three undergraduate students—to call them Undergraduate Transportation Scholars—as well as two graduate students, one post-doc, and one faculty member to attend the annual TRB meeting in January. Five of our students also attended the ITE Midwest District meeting held at the Wisconsin Dells, and our Traffic Bowl Team won the competition against five other teams. A KU graduate student presented a paper at the Conference on Rheology and Rheometry for the same destination. Another field trip was taken to the BNSF's Argentine classification yard in Kansas City, to watch how the railcars are redirected into trains headed to the Kansas Speedway.

This past year was also a very productive one for our MATC research projects. Dr. Schrock, for instance, was able to use the peripheral road around the Kansas Speedway to run a tractor-trailer combination over a set of portable rumble strips. Excellent data were collected. The project to mitigate wind-induced truck crashes caught the attention of KDOT. A meeting was held to see how the findings of this research could be implemented on the changeable message signs being installed on I-70 from Kansas City to the Colorado line. A paper on this research will be presented at the 2009 Mid-Continent Transportation Research Conference at Iowa State University this August. The third research project dealt with pavement damage costs associated with truck traffic. Data have been collected from the pavement management unit within KDOT, along with the vehicle miles of travel for heavy trucks in southwest Kansas, which is where the processed meat industry is located. A paper on this project will also be presented at the 2009 Mid-Continent Transportation Research Conference.

The second year of the MATC program through the University of Nebraska has again been a success, and I would like to see the current MATC arrangement continue indefinitely.

MATCHING FUNDS PROVIDED BY:

University of Kansas Research Projects
- Closed Course Testing of Portable Rumble Strips to Improve Truck Safety at Work Zones
- Estimating Highway Pavement Damage Costs Attributed to Truck Traffic
- Mitigating Wind-Induced Truck Crashes

KU MATC Education Program

KU MATC Education Program

The highlight of the year came when a team of students won the 2009 Regional ITE Jeopardy Contest at the Wisconsin Dells. Romika Jasrotia, Robert Rescot and Anthony Sands outscored teams from the University of Wisconsin and the University of Illinois in the final round. MATC funds were used to send these students, plus two other KU students, to this meeting.

Dr. Mulinazzi lectured in five different locations throughout Kansas on the Manual on Uniform Traffic Control Devices. He also made several presentations on Temporary Traffic Control to local personnel. Dr. Mulinazzi also talked with the pre-engineering class at Lawrence High School.

Robert Rescot and Dr. Schrock made presentations to a group of male high school juniors during the annual Survival Camp at KU. The campers were exposed to Syncro as a tool to analyze traffic flow as well as general transportation knowledge. Schrock and Rescot put on the same presentations for high school girls during their Project Discovery experience at KU.

Several meetings with KDOT personnel were held throughout the year. Dr. Mulinazzi met with several KDOT employees to discuss the results of the Wind-Induced Truck Crash research project. Dr. Schrock and Dr. Mulinazzi met with KDOT officials to give them updates on the preliminary appraisal of the safety and operational effects of the regional transportation system created by the new multi-modal facility in Gardner, Kansas. KDOT has an extreme interest in both of these research projects.
University of Kansas MATC Students Working on Research

**Cheryl Bornheimer, B.S.**
Undergraduate Research Assistant, Civil Engineering
**Project:** Mitigating Wind-Induced Truck Crashes
"I worked on a research project that investigated which truck crashes were attributable to high winds. In the course of my work, I analyzed crash reports in order to determine whether the cause of a crash was wind-induced or not."

**Umar Firman, B.S.**
Undergraduate Research Assistant, Mechanical Engineering
**Project:** Estimating Highway Pavement Damage Costs Attributed to Truck Traffic
"I enjoyed my work as an undergraduate research assistant working on the literature review and the collection of pavement cost data."

**Weihua Hou, Visiting Scholar**
Research Assistant, Civil Engineering
**Project:** Estimating Highway Pavement Damage Costs Attributed to Truck Traffic
"For this project, I was heavily involved in data collection, model development, model validation, and the preparation of the final report."

**Jacob Pohlman, B.S.**
Undergraduate Research Assistant, Architectural Engineering
**Project:** Mitigating Wind-Induced Truck Crashes
"I have really enjoyed my research with Dr. Mulinazzi. It has been a great learning experience for me to be able to be a part of the research and data collection process, and to see it through into the stages where the research actually has the capability of making a true impact. I was lucky enough to attend a KDOT meeting and see how research directly connects to the professional workplace. Dr. Mulinazzi was a great project leader and was really helpful and supportive of all of my research collection. Due to my great experience, I hope to be able to participate in more research opportunities in the future."

**Romika Jasrotia, M.S.**
Graduate Research Assistant, Civil Engineering
**Project:** Closed Course testing of Rumble Strips to Increase Work Zone Safety
"This project is about testing and comparing different types of Portable Rumble Strips for work zone areas and quantifying the uplift, sound, and vibration associated with them. The goal is to determine whether the Rumble strips can generate significant sound and vibration that can be identified by the driver. I have been involved in all the stages in this project starting from the planning stage, and have assisted with planning the whole closed course test, preparing data sheets, and reviewing the literature on this subject. I have also gone on field trips where we collected data using speed cameras and vibration and sound instruments, and have contributed to the project through data analysis and research papers I have written. This whole project has been a great learning experience for me."

University of Kansas MATC Affiliated Faculty

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Greetings again from Rolla, Missouri! The second-year projects at Missouri University of Science and Technology or Missouri S&T address additional MATC theme topics such as pavement monitoring, design and safety of roadways, and the increase of next-generation workforce in transportation industry.

According to the U.S. Department of Transportation, Region VII, particularly the state of Missouri, is a bottleneck of our nation’s truck flows. As the U.S. freight movements increase, the addition of new roadway lane-miles in Region VII has never been kept in pace with the increase of truck volumes. Existing highway pavements must be effectively preserved under heavy truck loads. To this end, sufficient field performance data of asphalt pavements are being collected; they will be used to validate the mechanics-based pavement design guide in terms of the impact of heavy truck loading on pavement performance. Pavement performance-related data such as traffic information, asphalt material properties, and subgrade condition will be collected and used for various analyses. The proposed study will likely provide insights on effective implementation of the guide into the design and analysis of pavements. Findings from this study will provide necessary information for the development of next-generation mechanics-rigorous design guidelines.

To meet the transportation workforce needs, an undergraduate internship program initiated with Missouri Department of Transportation will continue in the second year. The main objective of this program was to motivate undergraduate students to experience the design, maintenance, and operation process of the transportation system in Missouri. Thus far, 15 out of 34 intern students have been selected for MATC Scholarships. In addition, one graduate fellowship was established to increase the participation of U.S. students in transportation research.

MS&T MATC Education Program

Sixteen undergraduate students from MS&T were selected for summer internships with the Missouri Department of Transportation (MoDOT) as part of the MATC education program this year. The internship, which lasted for the summer semester and ended in late August, is designed to give undergraduates enrolled in transportation engineering programs practical work experience at a transportation agency and to provide professional exposure to administrative and technical tasks. Through this internship, students can expand their professional skills and complement their classroom learning with hands-on work experience, which can give them an edge over other candidates when applying for positions in a transportation-related field after graduation or may encourage them to pursue graduate degrees in engineering.

As part of their effort to recruit promising internship candidates, MATC and MS&T offer competitive pay during the internship period. Each student receives hourly payments from MoDOT in addition to a $1,000 scholarship provided by MATC. At the end of their internships with MoDOT, students submit a one-page report to the MATC Associate Director at MS&T, which describes the projects that they were involved in during the internship, as well as the roles each student played in the projects. Students also had a group photo taken on campus at MS&T.

This year marked the second year of the program, which has been very successful so far. According to the evaluations of the internship program submitted at the end of the period, the sixteen students selected to participate this summer overwhelmingly recorded positive experiences. For individual comments from this year’s interns, please go to pages 40 of this report.
I am a visiting scholar in the Department of Civil, Architectural, and Environmental Engineering. I joined MS&T in spring 2008. My research area is geotechnical engineering (constitutive modeling and computational mechanics). Throughout my studies I have focused on developing a general elastoplastic constitutive model for engineering materials. Using this model, I will eventually analyze and predict the long-term behavior of granular materials in asphalt pavements under repeated loading, which will improve the analysis and design methods of asphalt pavements.”
On August 25, 2008 the members of the MATC Advisory Board convened at the University of Nebraska-Lincoln Wick Alumni Center for their first annual meeting. Following an introductory presentation by Dr. Larry Rilett on the state of MATC, and a review of the theme and strategic plan, the MATC consortium partners presented the research, education, and tech transfer activities happening at each of their campuses. Next, board members discussed important issues affecting the freight industry that are related to tracking, railway, waterways, and logistics in a round table session. There were several excellent conversations on how MATC and its advisory board could be involved in addressing some of these issues and collaborating to provide solutions.

Before lunch, Dr. Prem Paul, Vice Chancellor for Research and Economic Development at UNL, welcomed the advisory board and associate directors to UNL and thanked them for their support. The afternoon continued with a discussion among the MATC Research Directors on issues facing the DOTs. After some additional discussion of various topics brought up throughout the meeting, the focus of conversation turned towards solutions that MATC could provide and towards ways in which it could strengthen its relationships with the private and public sectors. There were also several action items that were developed and put into place over the next year.

The day ended with a live crash test and a tour of the Midwest Roadside Safety Facility. We are very thankful to all our board members for their excellent support and continued efforts to help make MATC a success and improve freight transportation in Region VII.
MATC Research Projects Funded in Fiscal Year 2009

University of Nebraska Projects

Assessing the Risk of Crash for Trucks on Onset Yellow
PI: Dr. Anuj Sharma, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: This project aims at assessing the risk of crashes for trucks on the onset of yellow at isolated high-speed intersections. Red light running (RLR) and rear-end crashes are most typical of isolated high-speed intersections. A decision to continue through the yellow light can lead to a severe right angle crash, and a decision to stop at the onset of yellow can lead to a serious rear-end crash. This research will evaluate the crash risks of different types of trucks at the onset of yellow.

BENEFITS: The biggest benefit from the project would be the enhanced safety of truck movements. A chart for the dilemma hazard function for trucks on the onset of yellow will be developed. This will help the practitioners to leverage developments in sensor technology to provide adaptive and case-sensitive design for safe and efficient operation of signals at high-speed intersections.

Impact of Truck Loading on Design and Analysis of Asphaltic Pavement Structures
PI: Dr. Yong-Rak Kim, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: This research study proposes to develop methodologies and material models for simulating wire rope in large deformation impact scenarios. The first step in the development is to study the current wire rope through a series of dynamic component tests. The results of those tests will be used to characterize the behavior of the wire rope. This characterization, combined with existing information concerning wire rope behavior, will be used to develop strategies for effectively modeling wire rope.

BENEFITS: The capability to model wire rope performance will provide a basis and a springboard for innovations in cable barrier systems as well as in the wire rope itself. Ultimately, these innovations will result in a corresponding increase in the overall safety of the nation's transportation infrastructure.

Design of High Tension Cable Post Bases
PI: Dr. John Rohde, Associate Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Many DOTs desire minimal maintenance and low repair costs of median cable systems. Foundations with sleeves to facilitate the replacement of posts seem to be a good solution. Unfortunately, these systems currently have high capital costs and, in many instances, poor performance. This project will develop high-tension cable median post base designs for a variety of soil and weather conditions.

BENEFITS: The result of this study will be a rational design methodology based on in situ soil conditions for cable post foundations in high tension cable systems. This design method will compare construction and maintenance costs to minimize the life cycle costs of the post/sleeve system, which will allow various transportation agencies to look critically at existing foundation designs in terms of anticipated life cycle costs and performance.

Development of Advanced Finite Element Material Models for Cable Barrier Wire Rope
PI: Dr. John Reid, Professor, Mechanical Engineering
Co-PI: Robert Biehler, Research Associate Engineer, Midwest Roadside Safety Facility, University of Nebraska–Lincoln

DESCRIPTION: The 1993 and 2008 Midwest floods showed that with weather pattern changes, the return period of extreme floods may become short, which poses a threat to existing river bridges. This study transfers the recent supercomputer simulation technology of inundated bridge hydrodynamics from laboratory scales to practical design scales.

BENEFITS: The results of the study will provide bridge engineers with an innovative tool to accurately estimate hydrodynamic loads when bridge decks are inundated during extreme floods.

Computational Design Tool for Bridge Hydrodynamic Loading in Inundated Flows of Midwest Rivers
PI: Dr. Junke Guo, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln
Co-PI: Dr. David Admiral, Associate Professor, Civil Engineering, University of Nebraska–Lincoln; Dr. Tian Zhang, Civil Engineering, University of Nebraska–Lincoln

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Truck Safety at Railroad Crossings
PI: Dr. Ameel Khatib, Associate Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Truck safety at highway-railroad grade (HRG) crossings is a concern in Nebraska as well as nationwide. Large trucks constitute approximately 70% of the accidents reported at HRG crossings in Nebraska. This research assumes that unsafe interactions between trucks and trains are indicative of overall safety levels and a precursor to crashes. There is no current data on the frequency and rate of unsafe interactions between trucks and trains in Nebraska, nor is there any information available on the factors that are associated with those unsafe interactions. The discovery of such information will facilitate the assessment of the problem.

BENEFITS: The information obtained from the development of unsafe interactions between trucks and trains will attempt to discover information that will facilitate the assessment of truck safety at HRG crossings. The results will provide direction for the development and testing of equipment that reduces unsafe truck-train interactions.

Risk Mitigation for Highway and Railway Bridges
PI: Dr. Andrzej Nowak, Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Bridges are vulnerable to hazards stemming from negligence and improper maintenance, overloading collisions, intentional acts of vandalism, and extreme events such as natural disasters or terrorist attacks. While these structures must be protected, the current approach to risk is not always rational. A sensitivity analysis will be performed to relate the reliability of bridges and reliability of the transportation network.

BENEFITS: We will develop risk analysis procedures for the transportation network including highway and railway bridges, as well as selection criteria for the target risk level and implementation procedures for risk control. The major component of the project is the development of rational selection criteria for the target risk for bridges, depending on the consequences of failure and relative costs.

Impact of Truck Loading on Design and Analysis of Asphaltic Pavement Structures
PI: Dr. Yong-Rak Kim, Assistant Professor, Civil Engineering, University of Nebraska–Lincoln

DESCRIPTION: Better preservation of existing highway infrastructure against the effects of heavy load trucks is necessary. With more accurate and realistic analysis of pavement structures, more successful preservation will be attained. To this end, this study analyzes actual roadways in Nebraska and Missouri by comparing results from the newly-developed pavement design guide (i.e., the Mechanistic Empirical Pavement Design Guide (MEPDG)) with the results from the purely mechanistic analysis based on the finite element method (FEM). The results from this comparison will then be evaluated with regard to possible improvements in the design and analysis of pavement structures.

BENEFITS: The results will provide a better understanding of the effects of heavy load trucks on the overall structural performance and life of pavements, as well as a potentially more appropriate implementation of the MEPDG into pavement designs.

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University of Nebraska Projects

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Study of RF Propagation Characteristics for Wireless Sensor Networks in Railroad Environments

**PI:** Dr. Hamid Sharif, Professor, Computer and Electronics Engineering, University of Nebraska–Lincoln
**Co-PI:** Dr. Michael Hempel, Computer and Electronics Engineering, University of Nebraska–Lincoln
**DESCRIPTION:** This project investigates the impact of signal propagation for Wireless Sensor Networks in railroad environments. The wireless transmitters’ electromagnetic waves interact with the steel construction of freight cars. It is crucial to understand the impact this interaction has on the performance of wireless transmissions and how the placement of the transceivers can be optimized to improve the performance. This is a vital issue for improving the safety and security of railroad operations, since it allows for the monitoring of the railroad tracks, freight, and train staff, as well as for the protection of the transported goods, the environment, and human life.

**BENEFITS:** This proposed research and its outcomes allows the improvement of the overall network performance and robustness, and enables a wide range of novel applications in this domain. It will help improve the safety and security of railroad operations and also has a direct application for other modes of surface transportation.

Improving Safety of the Surface Transportation System by Addressing the Issues of Vulnerable Road Users: Case of the Motorcyclists

**PI:** Dr. Sunanda Dissanayake, Assistant Professor, Civil Engineering, Kansas State University
**DESCRIPTION:** While some highway safety improvements have been achieved in certain categories, the number and percentage of motorcycle crashes have increased significantly in the United States. Accordingly, it is necessary to pay focused attention to the topic and in this study. This project proposes the study and analysis of crash data related to motorcyclists with the intention of identifying problem areas and issues relevant to motorcycle safety.

**BENEFITS:** Based on the findings of the project, areas requiring more attention in terms of improving motorcycle safety will be identified and ideas for mitigation measures will be developed. In addition, relationships between helmet usage and motorcycle safety also will be established.

Assessing the Damage Potential in Pretensioned Bridges Caused by Increased Truck Loads Due to Freight Movements (Phase 2)

**PI:** Dr. Robert Peterman, Professor, Civil Engineering, Kansas State University
**DESCRIPTION:** This research is aimed at determining the existing stresses in a concrete member. The first step is to image the concrete in its in-situ stressed condition at a desired location, and then cut around the imaged area using a diamond core bit to a depth of approximately one inch. The result will be a “re-bounding” of most of the elastic strain carried by the concrete member at that point. By re-imaging the point after penetration by the core drill, the change in surface strain can be determined, and thus also an estimate of the initial internal stress. Phase 2 extends the work to pretensioned members with multiple bonded tendons.

**BENEFITS:** One of the most attractive features of this new measurement technique is that there is typically no surface preparation required. The reflective properties of the member’s surface serve as a “fingerprint” of the unique location. Thus, an engineer or technician can begin taking initial baseline measurements within minutes of arriving at a bridge site.

Extending Asphalt Pavement Life Using Thin White Topping

**PI:** Dr. Mustaque Hossain, Professor, Civil Engineering, Kansas State University
**DESCRIPTION:** Thin white topping (TWT) can be a cost-effective measure that extends the life of existing asphalt pavements. This project is aimed at calibrating the TWT design method developed by the Colorado Department of Transportation using data from an experiment conducted under the accelerated pavement testing (APT) program at Kansas State University.

**BENEFITS:** The project is expected to produce recommendations regarding design of TWT for routes with high truck traffic. The optimal design for a given existing AC pavement condition and truck traffic volume will also be identified.
**Fiscal Year 2009**

**Closed Course Testing of Portable Rumble Strips to Improve Truck Safety at Work Zones**

**PI:** Dr. Steven Schrock, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

**Co-PI:** Dr. Yong Bai, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

**DESCRIPTION:** Work zone safety is of paramount importance for both drivers and workers, and vehicle speeds are directly proportional to such safety. At flagger-controlled work zones, approaching vehicles that fail to stop can result in severe crashes if a stationary queue is present. If the oncoming vehicle is a large truck, such a crash could involve many more vehicles. Consequently, alerting truck drivers at these locations can improve safety.

**BENEFITS:** This study will evaluate the potential of using temporary reusable rumble strip units to improve worker and driver safety at short-term work zones, particularly flagger-operated work zones that may result in unanticipated queuing. The rumble strip unit could be an effective method of alerting drivers that they are approaching the work zone.

**Mitigating Wind-Induced Truck Crashes**

**PI:** Dr. Thomas Malinazzi, Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

**Co-PI:** Dr. Steven Schrock, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

**DESCRIPTION:** The objective for this research is to provide increased safety for motor carriers traveling across Kansas by reducing the likelihood of a wind-induced crash. The work will be done in concert with the Kansas Department of Transportation, the National Weather Service, and the Kansas Highway Patrol, among other stakeholders, to identify high-risk corridors and subsequently enable the correlation of wind advisories to roadway segments, and to develop a framework for improving wind-related warnings to truck drivers for the forthcoming ITS system. Additional research will be conducted in order to differentiate at-risk vehicles based on profile and weight.

**BENEFITS:** The benefits of this research include improving safety for motor carriers on highways in Kansas, and subsequently the safety for other vehicles sharing the road with motor carriers. With a decrease in wind-induced crashes, the disruption in interstate commerce that costs stakeholders lost productivity and revenue also will decrease.

**Estimating Highway Pavement Damage Costs Attributed to Truck Traffic**

**PI:** Dr. Yong Bai, Assistant Professor, Civil, Environmental, and Architectural Engineering, University of Kansas

**Co-PI:** Dr. Thomas Malinazzi, Professor of Civil, Environmental, and Architectural Engineering, University of Kansas

**DESCRIPTION:** Previous studies have found that trucks place heavy loads on highway pavement, which leads to significant road damage, thereby resulting in increased highway maintenance costs nationwide. The primary objective of this research project is to estimate the highway pavement damage costs attributed to truck (i.e., tractor trailer) traffic.

**BENEFITS:** Results of the study will be used to select cost-effective transportation modes for shipping goods and products, to better assess highway maintenance needs, to set up maintenance priorities, and to determine reasonable user costs.

**Improving Freight Fire Safety: Analysis and Testing of Real Engine Conditions to Progress Development of Mist-controlling Additives for Fire Mitigation**

**PI:** Dr. Albert Ratner, Assistant Professor, Mechanical and Industrial Engineering, University of Iowa

**DESCRIPTION:** Having found that mist-controlling agents appear to be applicable in reducing the danger posed by fuel fires for diesel-engine-based ground transportation vehicles, this proposal will endeavor to establish the actual fluid shear rates that occur in various phases of the diesel vehicle fuel system and relate these to liquid drop test conditions that are the primary focus of laboratory work. There are three key regimes that will be examined: normal flow and pumping (low shear), accident-induced fuel release (medium shear), and engine injection (high shear). The intent is to establish these values for the various fuel systems and for the range of diesel formulations.

**BENEFITS:** The goal is to establish a framework and identify fluid shear stress regimes that will enable the development of polymer additives that provide mist-control while being otherwise transparent to diesel fuel supply and to engine operation.
From May 18th through August 14th, 2009, fourteen undergraduate students from the University of Nebraska–Lincoln will be participating in a thirteen-week internship organized by the Mid-America Transportation Center and designed to enhance collaboration between students, transportation firms and agencies, and faculty members. Each year, the MATC’s Summer Intern Program attracts a large number of talented applicants seeking to broaden their knowledge of transportation engineering, learn about practical applications of theories discussed in undergraduate engineering courses, and work with some of the leading businesses and professionals in their field. The interns work full time for their sponsors and are encouraged to take responsibility for making the experience as profitable to their studies and careers as possible. A field trip to the sponsor companies and agencies that includes a presentation by each intern at his or her workplace provides the opportunity for the students to showcase their achievements and to introduce their fellow interns to their work. The sponsors, in turn, benefit from the program by working with promising transportation engineering students who have been selected by MATC based on their qualifications, interests, and academic achievements. For the sponsors, the internship is in effect a thirteen-week interview of potential future employees.

This year, eight sponsors are participating in the summer program. The companies at which students are interning include Felburg, Holt and Ullevig of Omaha, Iteris, Inc. of Lincoln, and Kimley-Horn Consulting, which is located in Dallas, TX. A number of students are working for transportation agencies such as the Nebraska Department of Roads and the City of Lincoln Public Works and Utilities Department, and half of this year’s interns are working at the MATC itself, focusing on the areas of transportation research and traffic engineering.

More than half of the 2009 interns are experiencing the program for the second time, having already completed a MATC summer internship the year before. Some of them are even interning at the same firm, agency, or institution as before. Joshua Redwine, for instance, who is spending his second summer in a row doing transportation research for MATC at the UNL campus, says that his positive experiences as an intern in 2008 and his desire to gain more experience in engineering research made him reapply this year. Rather than starting out from scratch and spending the first few weeks familiarizing himself with a new company and its projects, he wanted to deepen his knowledge in one specific field by continuing research he had first encountered a year earlier and by working with the same faculty members.

On May 15th, a few days prior to the beginning of the internship period, sponsors, interns, and faculty coordinators met at an orientation luncheon on UNL’s campus to receive information on this year’s program and to get acquainted with the other participants. At the meeting, Karen Schurr, a lecturer in civil engineering at UNL and the program facilitator, supplied important background information as well as suggestions on what the interns and sponsors could do to optimize the program’s benefits to them. She informed the participating students about the annual awards given to the intern with the best worksite presentation and to the author of the best internship report.

Site visits to sponsoring MATC firms and agencies will take place on July 17th. The interns submit their reports on August 12th, and the winning submission is selected shortly thereafter. The program typically ends with a celebratory luncheon, at which interns receive their certificates of recognition, sponsors are presented with appreciation gifts, and the winner of the 2009 Patrick T. McCoy scholarship for the most descriptive and best-written internship report is recognized. This year, the recognition luncheon will be held on August 15th.
Meet the 2009 UNL MATC Interns

John Coburn
Mid-America Transportation Center, Railroad Research, Lincoln, NE

“My current project that I am working on for Union Pacific allows me to combine railroad data, my water resources knowledge, and simple formulas to dynamically predict floods and impassable railroad tracks, which are presented through Google Earth. It’s a great feeling to know that I will help Union Pacific save millions of dollars each year in weather-related delays.”

Robert DuVall
Mid-America Transportation Center, Traffic Engineering, Omaha, NE

“I am thankful to MATC and Dr. Libby Jones for giving me the opportunity for my second internship. I really enjoyed working on many different projects with MATC because I learned more about the transportation career as a whole. This internship program has directed me in the transportation engineering direction, and I believe that will be a great fit for me.”

Chris Hennings
Mid-America Transportation Center, Transportation Research, Lincoln, NE

“After having such a good experience with my MATC internship last summer, I was eager to continue building on my transportation skills for another year. Now, after being exposed to two different companies covering a wide variety of projects, I can feel prepared to enter the working industry.”

Alex Kotrotsios
City of Lincoln Public Works and Utilities Department, Construction, Lincoln, NE

“Working with the City of Lincoln for the second summer has given me more of a deeper insight of the engineering field. I have seen large scale projects begin, take baby steps, and eventually come to their completion. It feels good to know that I have been a part of many of these projects.”

Jon Markt
Nebraska Department of Roads, Roadway Design, Lincoln, NE

“I reapplied to the MATC internship program because it is an experience that not everyone gets to have that has huge benefits for my development as an engineer and my future job prospects. This summer I have been the most excited about working on state highways to design roadside safety improvements.”

Tim Myer
City of Lincoln Public Works and Utilities Department, Traffic and Design, Lincoln, NE

“Working for the city has allowed me to be mentored by many experienced professionals who have taught me about the day-to-day things you can’t learn from a textbook. I will always be grateful for them taking the time to help me.”

Jennifer Schmidt
City of Lincoln Public Works and Utilities Department, Construction, Lincoln, NE

“After my MATC internship last summer, I expanded my educational horizons through spending a study abroad trip to Brazil, where I took an additional 12 credits and performed hands on work at the Midwest Roadside Safety Facility and their completion. It feels good to know that I have been a part of many of these projects.”

Robert Rescot
Mid-America Transportation Center, Railroad Research, Lincoln, NE

“With the ability to successfully balance research, teaching, research and service, in addition to working on his Ph.D. coursework, with a clear goal in mind of one day becoming a professor, he recognizes the vital importance of demonstrating during his graduate work, the ability to successfully balance research, teaching, and professional service requirements. Rescot is currently instructing the 2008 student of the year. Rescot is a University Regents Scholar and graduating with a bachelor’s degree in civil engineering at the University of Missouri – Kansas City and a master’s degree in transportation engineering from the University of Missouri – Columbia. Rescot is an ambitious student active in all phases of academic life including teaching, research and service, in addition to working on his Ph.D. coursework. With a clear goal in mind of one day becoming a professor, he recognizes the vital importance of demonstrating during his graduate work, the ability to successfully balance research, teaching, and professional service requirements. Rescot is currently instructing several lab sections of a land surveying course, and guest lectures periodically in several other transportation courses. He has also taught classes in the usage of the VISSIM microsimulation software as well as the theory and application of microsimulation.”

Jacob Reining
Kenley-Horn Consulting, Transportation Engineering, Dallas, TX

“During my past few years as a MATC intern, I have been exposed to a variety of different career opportunities within transportation engineering. My internships had provided me with many real-world experience and skills that I will be able to use throughout my professional career.”

Shashwat Rijal
Mid-America Transportation Center, Transportation Research, Lincoln, NE

“Being part of the MATC intern program for another year, I was exposed to research on a variety of transportation issues. I learned that research is vital in analyzing and possibly modifying previously used and recommended designs and ideas. This experience will greatly help me enter the work field and someday further pursue my education.”

Scott Sorensen
Mid-America Transportation Center, Transportation Research, Lincoln, NE

“This summer internship has opened up a lot of new doors for me and opened my eyes to opportunities that I didn’t know I had. It has also helped me to think about what I want to do in the future with my career and find the ways to get those things done.”

Nicole Voelte
Mid-America Transportation Center, Traffic Engineering, Omaha, NE

“The more I learned about transportation engineering in school the more interested I became. So when Karen told me about the MATC internship I thought it would be a great opportunity to get some hands on experience and see for myself if this was a field that I would enjoy working in every day.”

Derek Nieveen
Illis, Inc., Intelligent Transportation Systems and Traffic, Lincoln, NE

“The reason I reapplied to the MATC internship at Illis, Inc. was because of the experience I had last year with them. I learned a lot from three experienced professional engineers in an environment that I felt comfortable. This summer, I have been given more responsibility working on projects in Kearney and Hastings. I’ve enjoyed learning and participating in projects that use innovative technology and software to help people move efficiently.”

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City of Lincoln Public Works and Utilities Department, Construction, Lincoln, NE

“I am thankful to MATC and Dr. Libby Jones for giving me the opportunity for my second internship. I really enjoyed working on many different projects with MATC because I learned more about the transportation career as a whole. This internship program has directed me in the transportation engineering direction, and I believe that will be a great fit for me.”

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Missouri S&T Intern Program

The Mid-America Transportation Center worked with Missouri Department of Transportation to develop an intern program for students from the Missouri University of Science and Technology. Here are just a few of the students and their experiences during their internships this past summer.

Tyler Lindsay
Materials Intern
What I liked best about my summer internship was not only using the skills I had learned in school to perform engineering work, but learning how to communicate with the many different people that a project involves. There are usually many people working on project at a given time, and the best part is learning how they all work together to achieve one goal.

Stephen Bostic
Construction Intern
Working for the Missouri Department of Transportation, as a construction intern, has been a great experience. I was fortunate enough to start work just about the time that the construction of an overpass at Route U and Interstate 64 began. Being assigned to this project was the perfect opportunity for me to learn. Before this summer, I had very little experience with the steps that go into building a bridge. Now, at the end of the summer, I have great confidence in my ability to know all of the steps that are taken to build such a large structure. I have not yet made it to achieve one goal.

Mario Brontoli
Construction Intern
My internship with MoDOT this summer was exactly what I was looking for. The people I worked with taught me as much as I learned from the actual work. I was able to see the different types of road and bridge work I may do in the future as an engineer. I didn’t expect to get so deeply involved in the project management side like the paperwork, but this was a useful learning experience as well.

Colleen McBryan
Materials Intern
During this internship, I learned how to apply knowledge gained in classroom settings to real-life situations. I also learned how to work quickly and professionally with people of many different backgrounds, education levels, and positions of authority. These experiences will benefit me considerably in my future career.

Renee Moreiland
Construction Intern
The skills that I learned at my second summer internship with MoDOT are some that I can take with me throughout my career. I learned not only how to do specific tasks such as striping, asphalt, and concrete, but also life skills like managing people and projects. I had a great internship with MoDOT, and what made my internship so enjoyable was the talented group of people I had the privilege to work with.

Brian Shollar
Traffic Intern
At my summer internship in the traffic department at MoDOT, I enjoyed the diversity of the projects I was introduced to. I gained experience in everything from striping to signal programming. This diverse range of tasks allowed me to better relate my academic experience to real-world applications. I also met a great group of people here at MoDOT, who are always willing to help.

Eric Shelton
Construction Intern
My summer internship with MoDOT has been a great opportunity to familiarize myself with the construction field. I always felt that I understood my class content but knew very little about what was actually going on in the field. Every day at my internship there was an opportunity to learn in the field. Learning opportunities include performing concrete and materials testing, watching a project from start to finish, talking to different workers and engineers, reading plans, and inspecting work. After my internship, I feel that I have become quite experienced in the construction field.

Renee Moreland
Construction Intern
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Brian Tucker
Construction Intern
My experience this summer working with MoDOT was both enjoyable and educational. I was able to get out of the office and into the field and really see how a large construction job is managed. As a construction engineer, I now know I must be able to come up with solutions to problems that I will be faced with on a daily basis while on the job site.

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Peter Joplin
Construction Intern
What I liked most about my summer internship with MoDOT was the broad range of activities I was allowed to participate in. I enjoyed being able to see all aspects of what MoDOT Inspectors do as part of their job duties. I think the whole experience was very eye-opening and showed me what I could expect should I pursue a career as an engineer in the transportation field.

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MATC Graduate Students Collaborate on Cross-Campus Chapter Activities

On March 31, 2009, MATC-funded student members of ASCE and ITE Chapters at UNL, KSU, and KU came together in Topeka, Kansas, to discuss future chapter activities and joint projects. The University of Nebraska—Lincoln was represented by several students attending the meeting, including M.S. student Miao Gao, and Ph.D. students C.J. Hsu and Hang Yue. Robert Roeser, a Ph.D. student from the University of Kansas, was also present, as were Kansas State students Nathan Whitcomb, an undergraduate, and Brian Geiger, who is pursuing his Ph.D. It was an excellent evening full of fun, fellowship, and exciting ideas for future collaboration.

Lincoln Math Teacher Receives Presidential Award

Southwest High School math teacher Jerel Welker develops critical thinkers and problem solvers, not just kids who know about quonatils and integrals. That ability to teach students how math relates to their world, and to learn in new ways, allows kids to take risks—to do things differently and to learn in new ways.

Welker received $10,000 from the National Science Foundation, one of ninety-nine recipients across the country who all teach math and/or science to students since 2004. Welker’s expertise lies in integrating technology into his classroom, and more importantly, fostering an atmosphere of respect and trust in his classrooms, which allows kids to take risks—to do things differently and to learn in new ways.

The only teacher selected from Nebraska, Welker also represents Lincoln. After teaching at Lincoln High School for many years, he has been teaching at Southwest High School since 2004.

Cross-Campus Chapter Activities

From June 17-19 and July 15-17, 2009, eighteen high and middle school teachers, as well as twenty-two students, participated in the fourth Professional Development Science and Math Summer Technology Institute at the University of Nebraska—Lincoln. The summer institute, which is sponsored by the Nebraska Coordinating Commission for Postsecondary Education and by the U.S. Department of Transportation, is intended to develop the skills of teachers in the use of engineering resources available through the UNL Engineering Department, and to increase the interest of high and middle school students in the fields of science, technology, math, and engineering through exposure to real-life transportation problems.

The summer institute consists of two parts that emphasize different outcomes and learning experiences. Part I (June 17-19) brings the teachers together at UN campuses in Lincoln and Omaha, where they interact with engineering researchers, graduate students, and professionals in the transportation industry. Presentations, tours of relevant sites, and conversations with peer teachers who participated in the summer institute in previous years are designed to help the visiting teachers develop lesson plans that they then take and refine during Part II (July 15-17) of the summer institute with the help of the participating students, and implement in their own classes over the fall semester. The middle and high school students participate only during the second part of the institute.

This year, the institute’s agenda included visits to Union Pacific’s Harriman Dispatching Center and to the distribution center of Werner Enterprises (both in Omaha), which were aspects of the institute that the teachers particularly enjoyed and considered excellent sources of inspiration for math and science lesson plans.

On the first day of the summer institute, the Lincoln-based group also went on a tour of the crash test site at the Midwest Roadside Safety Facility, where Dr. Ronald Faller pointed out different guardrail systems currently being tested for safety and explained the process by which a car is brought to crash into them with the help of an emulsive pulley system. At jetco consulting, one of the participating teachers from Goodrich Middle School in Lincoln, commented, this tour was especially inspiring to him since it provided him with a new perspective on developing lesson plans for the institute. He would be particularly interested, he said, in designing lessons that revolved around the changes in acceleration that occur in a crash test vehicle, which is pulled by another car with the help of a cable, as the pulley system is modified.

This year’s institute was the first to incorporate distance technology as the presentations by faculty members. Talks by Dr. Laurence Rilett and Dr. Aemal Khattak, for example, were broadcast live via video conferencing technology from the Lincoln campus to the Peter Kiewit Institute in Omaha, where half of the teachers attended many of the scheduled events.

2009 Professional Development Science and Math Summer Technology Institute at UNL

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This new element of the workshop was popular with both presenters and participants and will continue to be integrated into future summer institutes. Erika Volker, of Partnerships for Innovation, also made use of this technology in her presentation on "Eduacating Diverse Audiences" on June 19, engaging both the Lincoln and the Omaha groups through interactive assignments and partners designed to foster an exchange between the teachers in both locations.

Reactions to the first part of the summer institute were very positive. As Robert Williams, a teacher at Papillion-La Vista South High School, pointed out, he will have a hard time picking what projects to work on for the lesson plans he is supposed to design over the summer because all the presenters provided excellent materials. Williams said that he had decided to participate in the institute because he greatly benefited from previous internships, and he expected the experience to be of similar benefit to him.

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Forty seventh-grade students from McMillan Magnet Middle School (Omaha Public Schools) visited the Mid-America Transportation Center at the University of Nebraska–Lincoln on an engineering field trip designed to familiarize the students with important practical applications of engineering research and transportation technologies. On December 12, 2008, the students traveled to Lincoln and spent half a day visiting the RFID and Structures labs, viewing crash test presentations, and even trying their hand at operating traffic radar guns in 20-minute rotations. A group photo and quiz bowl with questions on transportation engineering, RFID technology, and structural engineering, in which the students demonstrated what they had learned during the day’s events, completed the visit.

Craig Schiller, a Ph.D. student at UNL and 2007 MATC student of the year, showed the students video feeds from an Omaha traffic signal at the ITS lab.

McMillan students visited the Structures lab and viewed the steel girders and concrete forms used in the construction of bridges. They also learned to use traffic radar guns with the help of Zeng Luo, a Ph.D. student, and Tim Foss, an M.S. student.

Above: Dr. Anuj Sharma gave an introductory PowerPoint presentation to the McMillan students.
The Mid-America Transportation Center was pleased to host the U.S. Department of Transportation’s Research and Innovative Technology Administration Grant Administrators, Amy Stearns and Lydia Mercado, who visited the University of Nebraska–Lincoln in August. It was a productive day, filled with presentations by the MATC director, associate directors, and faculty, as well as lab tours, meetings with students, and viewing of crash test results.

Dr. Larry Rilett, director of MATC, along with several MATC consortium partners summarized the accomplishments of the past year and provided overviews of the research, technology transfer initiatives, human resources, diversity initiatives and program goals that were planned and/or taking place at each of their campuses.

During the afternoon, discussion focused on MATC business operations and the status of reporting requirements for the center. Amy Stearns and Lydia Mercado shared their expertise and positive response regarding MATC’s activities and progress to date. The day concluded with tours of the lab facilities used for MATC research projects, including the mobile intelligent transportation systems van and lab, the structures lab, the materials lab, and the radio frequency identification lab. Stearns and Mercado were able to interact with the faculty and students who were doing the research in each of the labs. A brief tour of the MATC offices was followed by a bus tour to the Midwest Roadside Safety Facility, where graduate students displayed the results and discussed the barrier research conducted during the previous day’s crash test.
The HDC has also implemented a sophisticated weather monitoring system that utilizes GIS data to constantly determine the weather conditions on every mile of track. This information is critical in order to mitigate any possible weather interference (hurricanes, tornadoes, etc.), which could create congestion, or even damage tracks or trains. It also allows dispatchers to keep track of every train on every track every minute of every day, so that goods and people are moved safely, quickly, and efficiently through the rail system.

The HDC has also been recently remodeled with state-of-the-art technology and software, the dispatch center coordinates up to 2,000 freight trains simultaneously on over 25,000 miles of track. The first train was dispatched from the newly remodeled center in February of 2008. Equipped with today’s advanced technology and cutting-edge sound control with an acoustic cloud throughout the HDC, the dispatch center coordinates up to 2,000 freight trains simultaneously on over 25,000 miles of track. This information is critical in order to mitigate any possible weather interference (tornadoes, hurricanes, etc.), which could create congestion, or even damage tracks or trains. After receiving their safety equipment, the party headed out to the job site in a bus. Miles before the actual site, train cars full of concrete ties that were to be fed to the TRT announced the proximity of the machine. With their bus driving in the right-of-way of the railroad tracks, participants were able to get an up-close view of the old ties, soon to be replaced by the renewal train.

The TRT 909, which is comprised of 30 rail cars, is about half a mile long. When running, this train can replace the ties and rails in one sweep, presenting an amazing spectacle as the old ties are replaced with new ones in a matter of seconds. Old rails are weaved out of the way as new rails are moved into place without interrupting the course of trains, which can run on the parallel track while work on the rails is underway. Decades ago, workers would have spent hours doing what the TRT 909 does in minutes. In one eight-hour day, this machine can replace up to 3,000 rail ties, which amounts to an average of about six miles per hour.

After viewing the process for an hour, the party returned to Lincoln, impressed with this model of engineering ingenuity. Many of the students voiced their appreciation of the remarkable learning experience afterward, expressing gratitude to the ITE and ASCE for the invitation to the field trip and to the volunteers from Union Pacific for their informative presentations. Union Pacific’s TRT 909 is the only one of its kind in the nation, and the field trip provided students with the extraordinary opportunity to view this machine in action. For many of the UNL and KU students attending the conference, one of the most inspiring moments of the TRB meeting was receiving his award at the annual banquet that the Council of University Transportation Centers hosts as part of the TRB meeting. All of the students expressed gratitude to MATC and the USDOT for providing the funding that allowed them to travel to this important conference. Attending the TRB annual meeting has helped them to see the importance of their own work in a global context and to exchange ideas with other scholars and engineers in their areas of interest in person.
ITS Heartland hosted its tenth annual meeting at the Capitol Plaza Hotel in Topeka, KS, from March 30 to April 1, 2009. Numerous transportation professionals, academic researchers, and graduate students from Nebraska, Iowa, Kansas, Missouri, and Oklahoma attended the meeting, which began on Monday, March 30 with the ITS Operations Symposium and a tour of the Kansas Turnpike Authority facilities in the afternoon. Afterward, the advisory board members of ITS Heartland held a board meeting, followed by a celebration of the meeting’s tenth anniversary at the Topeka Civic Theater that was open to all attendees.

Much of Tuesday and Wednesday was reserved for conference presentations and receptions designed to showcase featured vendors. For the first time this year, ITS Heartland issued an invitation to students to submit an abstract for a presentation at the annual meeting that would also be considered for the new student paper prize. The Board of Directors reviewed a total of thirteen abstracts and awarded the first prize to Chung-Jen Hsu, a Ph.D. student from the University of Nebraska–Lincoln (UNL). He received a prize of $1,000 and had the opportunity to present his paper titled “An Analytical Evaluation of Transmission Range in Vehicular Ad Hoc Networks” in a morning session on Wednesday, April 1. An abstract by another UNL graduate student, Hang Yue, was ranked second by the reviewers, earning her the award of $300.

The tenth annual meeting of ITS Heartland, which was adjourned on Wednesday afternoon in a closing session that looked ahead to the opportunities and challenges facing ITS in the future, was very well received and described as highly successful by the participants. Each year, this forum, which is among the best in the United States, brings together representatives of the public, private, and academic sectors to trade ideas and discuss important developments and issues in transportation engineering in the five member states.

ITS Heartland’s eleventh annual meeting is scheduled to take place in Omaha, NE, at the Embassy Suites from March 30 to April 1, 2010. For more information, visit www.itsheartland.org.

ITS Heartland held its first systems engineering workshop this fall at the Oklahoma Department of Transportation in Oklahoma City. With thirty-five ITS professionals in attendance, discussion topics included information on the federal requirements for systems engineering as documented in Rule 940.11. The benefits and organizational implications of applying systems engineering in traditional project development and implementation processes were evaluated, while training and technical resources were made available to help further the understanding of systems engineering and its application. The workshop used the new guide, “FHWA Systems Engineering for Intelligent Transportation Systems: An Introduction for Transportation Professionals,” as a primary reference to introduce systems engineering.

The presenters were Cliff Heise, who is the eastern region vice president of Iteris, Inc., and Mac Lister, an ITS specialist at the FHWA Resource Center. Heise, who is responsible for programs at the federal, state, and local levels, and manages a team of systems, software, and transportation engineers, has over twenty-four years of project management experience in the areas of systems and software engineering throughout all phases of program development. Lister provides training, outreach, and technical support for the National ITS architecture and systems engineering programs. He is also the team leader for the FHWA’s National Field Support team for Regional Architecture implementation and a member of the FHWA Operations Council’s architecture and systems engineering working group, as well as the field co-chair of the Planning for Operations Working Group and a member of the 511 Deployment Coalition Working Group. Lister has over thirty-five years of experience in the field of information systems.

The workshop was a joint effort between the ITS Heartland Chapter, ITS America, the Oklahoma Department of Transportation, the Mid-America Transportation Center, and the Oklahoma Transportation Center. A special thanks to Alan Stevenson and the Oklahoma DOT for hosting the workshop and to Matt Vols of Telvent Farradyne, Inc. for his coordination with ITS America.
MATC Financial Information for FY 2009

Planned Expenditures
Funds Allocated for Education, Research, Administration & Technology Transfer

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<th>Category</th>
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<tr>
<td>Education/Human Resources/Diversity</td>
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<td>Technology Transfer</td>
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<td>Administration</td>
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Distribution of Federal Funds to Partners
TOTAL = $914,000

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<tr>
<td>MS&amp;T</td>
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<td>UI</td>
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UNL receives 50% of the federal funds and the remaining 50% is distributed to our partners.

MATC Source of Funds
TOTAL = $3,656,000.00

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<tr>
<td>RITA - USDOT</td>
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Annual Report
Fiscal Year 2009
www.mutc.unl.edu