

2009 Annual Report



**MID-AMERICA
TRANSPORTATION CENTER**

www.matc.unl.edu

**MATC: Improving Safety
and Minimizing Risk
Associated with
Increasing Multi-modal
Freight Movements**



MID-AMERICA
TRANSPORTATION CENTER

(MATC)

Mid-America Transportation Center

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**MID-AMERICA
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Letter from the Director	6
Vision and Philosophy	8
Overview of Consortium Members	9
Transportation-Related Research Programs	10
Institutional Resources	11
Center Personnel	12
Associate Directors.....	13
Advisory Board.....	14
Private Sector.....	14
Public Sector.....	16
Research Directors.....	17
Organizational Structure.....	18
Education Administrators.....	19
MATC Staff.....	19
Partnerships	20
University of Nebraska – Lincoln.....	21
Educational Activities.....	21
Research Project Listing.....	22
Students Working on Research.....	22
Affiliated Faculty, Research Staff, & Partners.....	25
Kansas State University.....	27
Letter from the Associate Director.....	27
Research Project Listing.....	28
Education Program.....	28
Tech Transfer Activities.....	28
Students Working on Research.....	28
Affiliated Faculty.....	29
University of Iowa.....	30
Letter from the Associate Director.....	30
Research Project Listing.....	31
Education Program.....	31
Students Working on Research.....	32
Affiliated Faculty.....	33
University of Kansas.....	34
Letter from the Associate Director.....	34
Research Project Listing.....	35
Education Program.....	35
Tech Transfer Activities.....	35
Students Working on Research.....	36
Affiliated Faculty.....	37
Missouri University of Science & Technology.....	38
Letter from the Associate Director.....	38
Research Project Listing.....	39
Education Program.....	39
Students Working on Research.....	40
Affiliated Faculty & Partners.....	41



Research	42
First Annual MATC Advisory Board Meeting.....	43
MATC Research Project Details: Descriptions & Benefits.....	44
University of Nebraska.....	44
Kansas State University.....	46
Missouri University of Science & Technology.....	47
University of Kansas.....	48
University of Iowa.....	49
Education	50
2009 MATC Summer Intern Program.....	51
UNL MATC Interns.....	52
Student's of the Year.....	52
Intern Award Recipients.....	53
MS&T Intern Program.....	54
MATC Graduate Student Collaboration.....	56
Lincoln Math Teacher Award.....	56
Math & Science Summer Institute.....	57
McMillan Middle School Visit.....	60
Technology Transfer	62
USDOT RITA Site Visit to MATC.....	63
Union Pacific Tour.....	64
TRB 88th Annual Meeting.....	65
ITS Heartland Annual Meeting.....	66
ITS Training Workshop.....	67
MATC Reporting Requirements	68
Planned Expenditures.....	68
Distribution of Federal Funds to Partners.....	68
MATC Source of Funds.....	68

Credits

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We at MATC would like to thank everyone for all of their hard work and cooperation through the process of making our second Annual Report. Without you it would not have been such a success.

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Letter from the Director: Reflections on the Past Year

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.



MATC Director
Dr. Laurence R. Rilett

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



MID-AMERICA
TRANSPORTATION CENTER

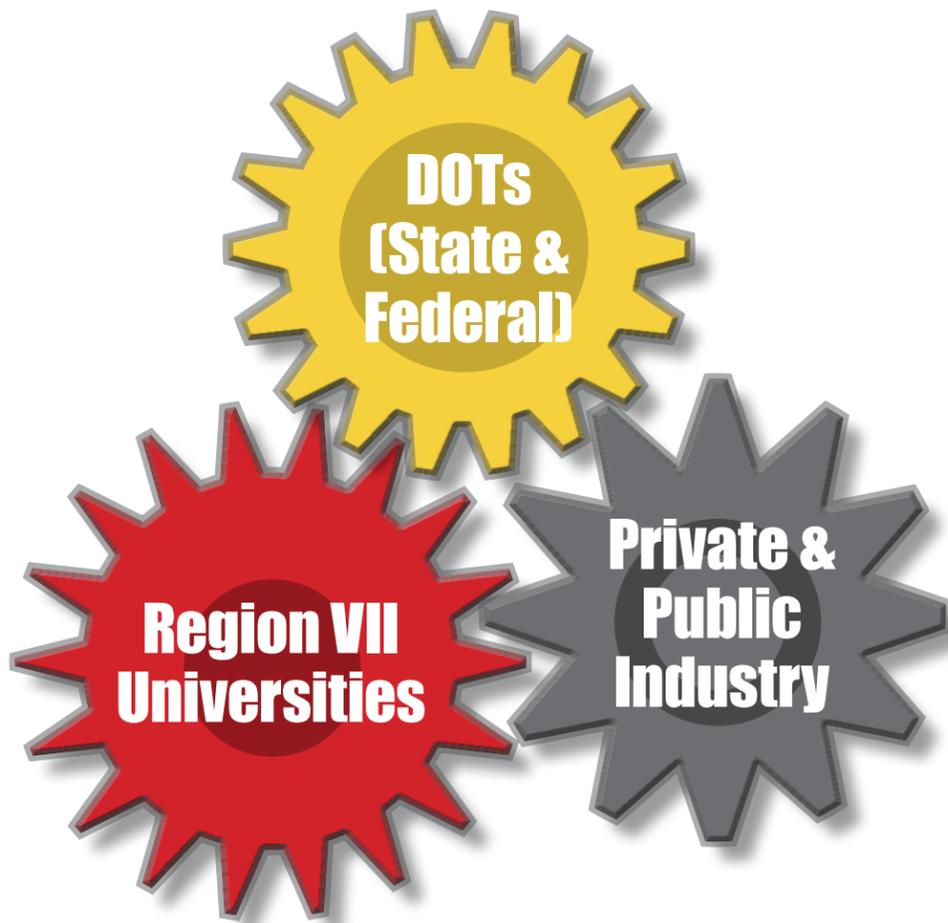


Vision

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 (IaDOT), the Kansas Department of Transportation (KDOT), 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, KSU, 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 \$150 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 hydraulics. The MS&T research activities related to infrastructural engineering and intelligent systems are coordinated by several research centers. The umbrella center, the Center for Infrastructure Engineering Studies (CIES), 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 rehabilitations, 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 Asphalt Laboratories, a falling weight deflectometer (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 facilitate interdisciplinary academic 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, LU's participation is critical to the success of the education and technology 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 has an established reputation for producing engineers, nurses, and educators and offers baccalaureate degrees in 50 academic majors, 37 master's degrees, and 4 doctoral degree programs through 9 colleges and schools. A member of the Texas A&M University System, the university is dedicated to fulfilling its land-grant mission of achieving excellence in teaching, research, and service. PVAMU serves as the principal liaison between MATC consortium members and HBCUs with engineering programs that do not currently participate in a regional or national UTC.

Transportation-Related Research Programs

The five state 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, KU, UNL). Highlights of these are listed below.

UNL
Nebraska Transportation Center
Mid-America Transportation Center
Local Technical Assistance Program
KSU
University Transportation Center
Center for Transportation Training and Research
KU
Local Technical Assistance Program
Rural Transit Assistance Program
Transportation Research Institute
Infrastructure Research Institute
Information and Telecommunication Technology Center
MS&T
Center for Infrastructure Engineering Studies
University Transportation Center
Natural Hazards Mitigation Institute
Intelligent Systems Center
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 state 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 (KSU), 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, KDOT, MoDOT) and private agencies (NASCAR, 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
Highbay Structures Laboratory
Applied Microwave Nondestructive Testing Laboratory
Trustworthy Systems Laboratory
Structural Health Monitoring Laboratory
UI
National Advanced Driving Simulator



**ASSOCIATE DIRECTORS
ADVISORY BOARD
RESEARCH DIRECTORS
ORGANIZATIONAL STRUCTURE
EDUCATION ADMINISTRATORS
MATC STAFF**

MATC Associate Directors

Dr. Elizabeth "Libby" Jones
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Associate Director, Mid-America
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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 masters' and PhD students. Currently she is supervising five masters' students and two Ph.D. students. Dr. Jones serves as the MATC Associate Director for UNL.

Dr. Genda Chen
Professor, Civil, Architectural and
Environmental Engineering
Associate Director, Mid-America
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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 masters' 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
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Associate Director, Mid-America
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Kansas State University
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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

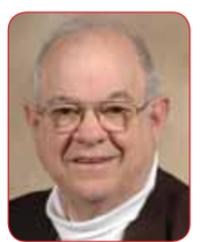
design of pavements, non destructive testing of pavements, and pavement and maintenance management systems. Dr. Hossain has conducted over 50 research projects, published over 44 peer-reviewed journal articles and has four patents related to his research. He is a Fellow of the American Society of Civil 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
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Associate Director, Mid-America
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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 a MATC Associate Director for the University of Iowa.

Dr. Tom Mulinazzi
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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 Profession 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.

MATC Advisory Board: Private Sector



Mr. E. Dean Carlson
Former Executive Director, FHWA
Former Secretary of
Transportation, Kansas

Mr. Carlson, former Executive Director of FHWA, former Secretary of Transportation for



the State of Kansas, and member of the National Academy of Engineering. In 2003, Dean Carlson retired from his position as Kansas Secretary of Transportation and began his consulting practice. He has nearly five decades of experience in the field of transportation; in addition to 8 years as Kansas Secretary, he served for 36 years with the Federal Highway Administration, retiring as Executive Director in 1994. His career with Federal Highway Administration included many positions in various Regional and Division Offices as well as the Headquarters in Washington, D.C. He has served as a member of the Executive Committee of the Transportation Research Board, and was its Chairman in 2002. He is also former President of the Board of Directors of the American Association of State Highway and Transportation Officials. In 2001, Secretary Carlson was elected to the prestigious National Academy of Engineers for "outstanding leadership and dedication in developing national highway policy, systems management initiatives and research programs." During his distinguished career, Secretary Carlson has received numerous awards from Presidents G.H.W. Bush and Clinton, the Federal Highway Administration, The American Association of State Highway and Transportation Officials, the National Research Council, the International Road Federation and the Road Gang.



Mr. David Connell
Vice President, Engineering
Union Pacific Railroad

Mr. Connell is the Vice President of Engineering for Union Pacific Railroad. David has worked for Union Pacific and predecessor



companies for 26 years having held a variety of field and staff positions including AVP- Construction, Chief Engineer - Maintenance of Way and various track research positions. In his current position, David directs the design, construction and maintenance of all track, signal and bridge infrastructure in the nation's largest railway. David holds a BS degree in Civil Engineering from NC State University and attended the Harvard Business School. He currently chairs the American Association of Railroad's Heavy Axle Load Committee and is a member of the Railway Technology Working Committee at the Transportation Technology Center, Inc.



Mr. Abbas Mohaddes
President and Chief
Executive Officer
Iteris, Inc.

Mr. Mohaddes is President and Chief Executive Officer of Iteris Inc. Prior to that, he was the Executive Vice President and General Manager from 2003 - 2007.

Prior to this appointment, Mr. Mohaddes was Senior Vice President and General Manager of Transportation Systems at Iteris.

Before his tenure at Iteris, Mr. Mohaddes served as President and Chief Executive Officer of Meyer Mohaddes Associates, Inc. (MMA), an Intelligent Transportation Systems (ITS) and Traffic Engineering firm that he co-founded in 1991. MMA was acquired by Iteris in 1998 to further augment the company's transportation systems consulting and design services. Mr. Mohaddes is a founding member of ITS America and a nationally recognized expert in ITS and Traffic Management. He is a published author and has presented over 50 articles at ITS/Transportation engineering professional organizations. Mr. Mohaddes is a fellow member of the Institute of Transportation Engineers (ITE), member of Transportation Research Board (TRB), board member of ITS America, and member of Design/Build Institute of America.

Mr. Mohaddes is a UNL Alumni and received his bachelor degree in Civil Engineering from the University of Nebraska. He also received his Master of Science in Transportation Engineering from UNL.



Mr. Dan Murray
Vice President, Research
American Transportation Research
Institute

Mr. Murray is Vice President of 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, USDA, CBP, 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 Northwestern University.



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 civil engineering from Tulane University in 1976. In 1990, Mr. Sehrt received an MBA



from the Owen School at Vanderbilt University. Since 1989, he has been with Ingram Barge Company, working primarily in the motor vessel engineering and barge maintenance areas.



Mr. Richard Reiser
Executive Vice President and
General Counsel
Werner Enterprises, Inc.

Mr. Reiser is Executive Vice President and General Counsel of Werner Enterprises, Inc., an Omaha-based motor-carrier and logistics company that provides



trucking service in 48 states. Dick is responsible for managing all of the legal, regulatory, and legislative affairs of Werner Enterprises, which include all general transportation and corporate legal matters. As a transportation expert, Reiser serves as Chairman of the Transportation Council of the Greater Omaha Chamber of Commerce, Nebraska State Highway Commissioner for District 2, Vice-Chairman of the Litigation Center Board of Directors for the American Trucking Association, and Member of the ATA's Board of Directors. Recently, Reiser also agreed to serve on the Board of Trustees of the Greater Omaha Alliance for Business Ethics.

Reiser's educational background includes a bachelor of science degree in business administration from the University of Nebraska-Lincoln (1968) and a juris doctorate degree from the University of Nebraska (1972). Prior to joining Werner Enterprises, he was in private practice in Omaha, Nebraska from 1972 through 1993. He is admitted to practice law in Iowa, Nebraska, the U.S. District Court for the District of Nebraska, and the U.S. Circuit Court of Appeals for the 8th Circuit.



Mr. Mark Stiles
Senior Vice President
Trinity Industries Inc.

Mr. Stiles is Senior Vice President of Trinity Industries, Inc. a premier multi-industry growth company. He is also the Group President and



directs worldwide business operations of the Construction, Marine and Components Group which is comprised of the following divisions: Trinity Highway Products, Trinity Renewable Energy Components, Trinity Rail Parts and Components, Trinity Marine, Trinity Logistics Company, Transit Mix Concrete and Materials Company, Armor Materials, and Trinity Materials, Inc. As Senior Vice President and Group President he oversees the operations and development of more than 7,000 employees.

Representing his hometown district of Beaumont, Texas, Mr. Stiles served as a member of the Texas House of Representatives, where he held numerous leadership positions during 16 years of service from 1982 to 1998. In the Texas House, he served as chairman of the House Committee on County Affairs, the House Committee on Ways and Means and an unprecedented three terms as Chairman of the powerful House Committee on Calendars. A recognized leader in the national business community, he is an expert in the area of heavy industrial manufacturing, transportation and infrastructure issues, and renewable energy policy. Mr. Stiles has testified numerous times before Congress, is very active politically and is a sought out speaker for major business and policy conferences throughout the country.



Mr. Ed Trout
Chairman, American Trucking
Association
President, Cornhusker Trucking
Cornhusker Motor Lines, Omaha

Mr. Trout is past chairman of the American Trucking



Association and current President of Cornhusker Trucking. In 1957, Mr. Trout graduated from Creighton Prep and then continued on to Creighton University, working nights on a dock for a local truck line while attending school. In 1960, he went to work for a truck line called Bee Line Motor Freight, and by 1968 he had moved up the ranks to vice president.

In 1972, Mr. Trout became president of Bee Line Transportation, when he started another division of Bee Line called Cornhusker Motor Lines, which he had the opportunity to buy in 1988. Since 1988, Ed and his three sons, Joe, John, and Tom, have run the enormously successful family trucking business. Ed has also served as chairman of both the Nebraska Trucking Association and the American Trucking Association.



Mr. Robert VanderClute
Senior Vice President, Safety and
Operations
Association of American Railroads

Mr. VanderClute is a Senior Vice President of safety and operations at the Association of American



Railroads. His department's responsibilities include the oversight of the industry's homeland security plan, equipment interchange standards, car service rules, quality assurance programs, and safety initiatives in addition to environmental issues, hazardous materials, communication signals, and tank car safety standards and design. Mr. VanderClute is the industry's liaison with the FRA, NTSB, EPA, DHS, FCC, and other regulatory bodies. After graduating from the University of Tennessee, where he majored in transportation, Mr. VanderClute completed graduate school programs at both the Darden Graduate School of Business at the University of Virginia and the Harvard Business School. He is a "fellow" with CILT and is active in several public and professional organizations.

Mr. VanderClute subsequently served as Vice President of Operations and later Chief Operations Officer at Amtrak. Reporting directly to Amtrak's president and chairman, Mr. VanderClute was responsible for the day-to-day operations of the company, including customer service, transportation, procurement and material management, safety, environmental, engineering, and mechanical service centers as well as other key corporate responsibilities. During his career, the corporation implemented a high-speed rail program, embarked on a six billion-dollar infrastructure improvement program, replaced virtually its entire motive power and car fleet, and became the largest contract carrier of commuter services in North America.

MATC Advisory Board: Public Sector



Mr. Michael Flanigon
Director, Office of Safety and Security
Office of Program Management
Federal Transit Administration

Mr. Flanigon has been involved in the rail transportation industry for over 35 years. He



began his career as a brakeman 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 2007 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.



Mr. Joseph Werning
Division Administrator
Federal Highway Administration
Nebraska Division

Mr. Werning was appointed Division Administrator for the Federal Highway Administration's



(FHWA) Nebraska Division on August 18, 2008.

In this capacity, Mr. Werning serves as the principal representative of the FHWA and is responsible for administering the entire federal-aid highway program in Nebraska. He is responsible for providing leadership and guidance to state, local, industry, and academic officials in the identification of transportation needs and priorities that, when implemented, carry out national transportation and safety program goals. He is also responsible for establishing division office goals and objectives that will meet the agency's strategic vision while maximizing available resources. Mr. Werning earned a bachelor's degree from the University of Maryland, College Park, in 1989. For the past 19 years, he 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.



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 1969 from the University of Nebraska—Lincoln, he worked for Shell Oil Company as a mechanical engineer in New Orleans, Louisiana for two years. In 1970, he began working for the Nebraska Department of Roads and spent one year as survey party chief and inspector in the

Omaha, Nebraska construction district. Mr. Frederickson 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, Expressway and Interstate. After four years as District Engineer in charge of construction and maintenance back in Omaha, he is currently in the 16th year as Deputy Director for Engineering Services in Lincoln, Nebraska.



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 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, hurricane evacuation analyses, 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, state-level transportation planning, and the refinement of economic development methodologies used to evaluate transportation-related activities. Dr. Perkins' extensive record of publication extends into both the national and international transportation and engineering education arenas.

Region VII State Agency Research Directors



Mara Campbell
Organizational Results Director
Missouri Department of Transportation

Mara Campbell is the organizational results director for the Missouri Department



of Transportation (MoDOT), a position she assumed June 2005. 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 Jefferson City. In the past, she has also served as MoDOT'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 the 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 for over 25 years. He has served on numerous local, and national Technical Advisory Committees for transportation related research projects. Mr. Jamshidi is a graduate of the University of Nebraska with a Degree in Civil Engineering, and is a Registered Professional Engineer in the state of Nebraska. He is a member of the AASHTO Subcommittee on Materials, a member of AASHTO Research Advisory Committee, and the Transportation Research Board's (TRB) representative for the NDOR.



Sandra Larson
Research and Technology Bureau
Director
Iowa Department of Transportation
Highway Division

Sandra Larson is currently director of the Research and Technology Bureau in the Highway Division of the Iowa Department

of Transportation, a position she has held since 2002. During her 21 years with the Iowa Department of Transportation, she has held various positions, including Engineering Bureau director, state bridge engineer, Ames resident construction engineer, and bridge design engineer. Sandra has two BS from Iowa State University in civil engineering (1988) and general science/ biology (1975) and is a registered professional engineer in the state of Iowa in civil and structural engineering. She serves on numerous TRB, FHWA, and AASHTO committees in the areas of research, structures, winter maintenance, and pavements.



Rodney "Rod" Montney
Engineer of Research
Kansas Department of Transportation

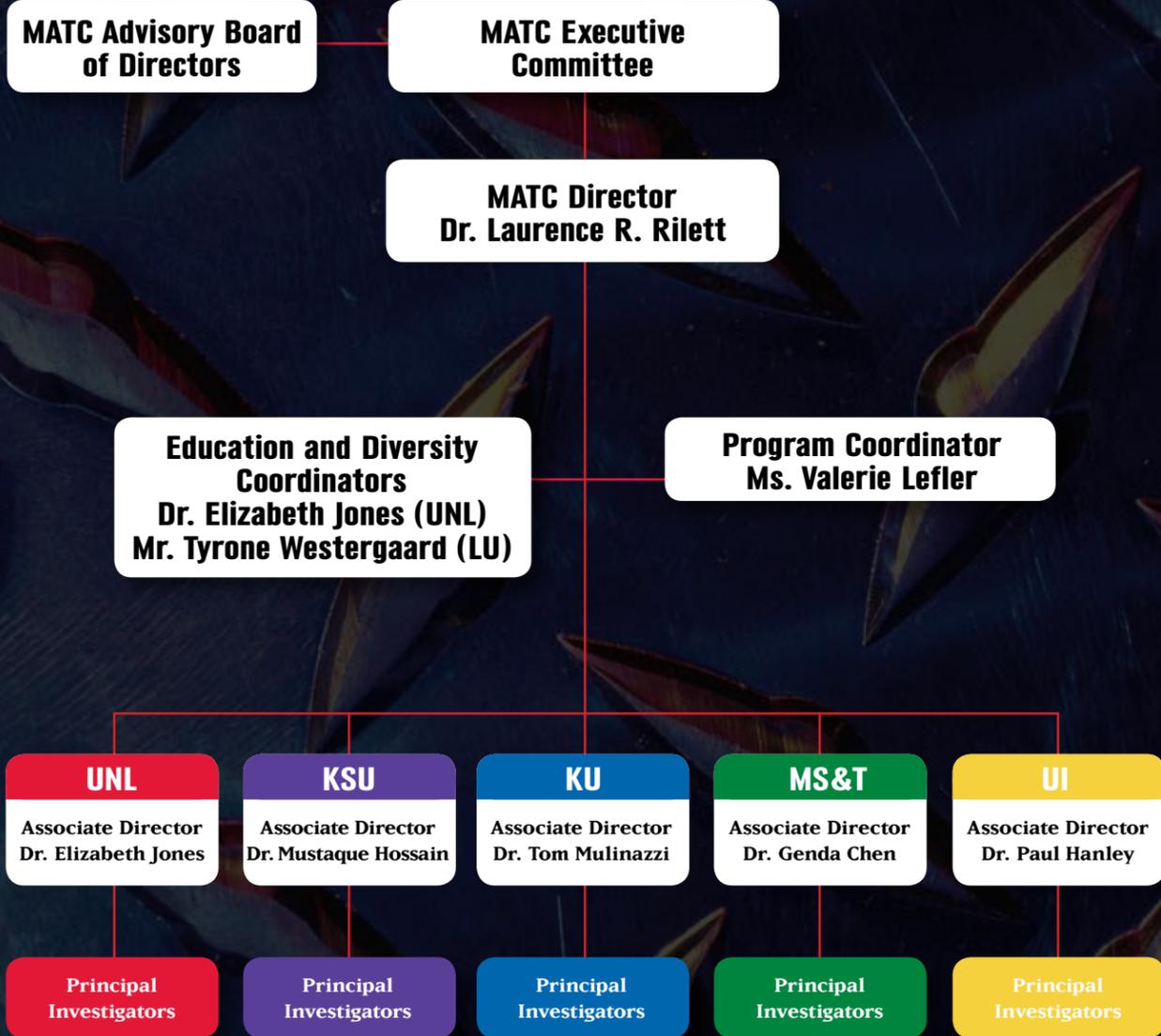
Rodney Montney is the engineer of research for the Kansas Department of Transportation (KDOT). In this position, he directs the agency's research activities and 25 staff members. He serves as chairman of KDOT's Research Technical Committee and secretary of its Research Program Council. Mr. Montney is a member of the AASHTO Standing Committee on Research (SCOR) and the AASHTO Research Advisory Committee (RAC). 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.



MID-AMERICA
TRANSPORTATION CENTER



Education Administrators



Dr. Elizabeth "Libby" Jones
Associate Professor, Civil Engineering
Associate Director, Mid-America Transportation Center
University of Nebraska-Lincoln

Dr. Jones serves as the MATC Coordinator for Education and Equity and will be responsible for coordinating the MATC educational and diversity programs.



Mr. Tyrone Westergaard
Assistant Professor, Business Administration
Lincoln University

Mr. Westergaard serves as the MATC Education Coordinator at Lincoln University and will help coordinate, along with Dr. Jones, the MATC diversity programs.

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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.



Pictured left to right: Jordan Mueller, Bethany Carlson, Jordan Pokorny, Geoffrey Priester, Paul Klopping.

PARTNERSHIPS

CONSORTIUM PARTNER HIGHLIGHTS

UNIVERSITY OF NEBRASKA-LINCOLN

KANSAS STATE

UNIVERSITY OF IOWA

UNIVERSITY OF KANSAS

MISSOURI S&T

UNIVERSITY OF
Nebraska
Lincoln

University of Nebraska-Lincoln

Lead Institution

Highlights at a Glance

University of Nebraska-Lincoln Educational Activities

For Letter from UNL
Director see pages 6-7

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.

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

For project details see pages 44-46

Matching Funds Provided by:



Mr. Soohyok Im, Ph. D. student prepares the dynamic modulus test which is one of the most important material properties for the Mechanistic Empirical Pavement Design Guide (MEPDG).



Ph. D. Students and coworkers viewing how a dynamic modulus works. Once the test is ready, a certain load is applied to sample at different temperatures.

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 thoroughway 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. Flood 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 geometrical 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."

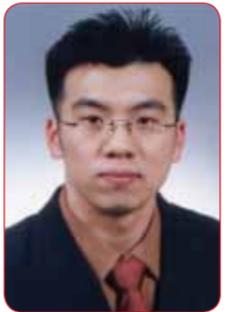


Soohyok Im, Ph. D

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."



Marta Lutomirska Wolinska, Ph.D.

Graduate Research Assistant, Civil Engineering

Project: Risk Mitigation for Highway and Railway Bridges

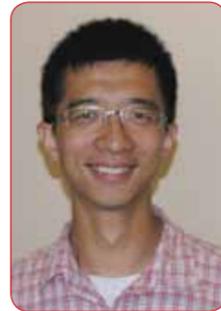
"Reliability of highway and railway bridges strictly influences performance of the entire transportation network. An important part of the research is a selection of acceptability criteria for bridges, as well as the determination of an acceptable target risk level depending on the consequences and costs 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."

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



"Working on "Design of High Tension Cable Post Bases" for Dr. Rohde was an enlightening experience. My task was to search the literature concerning 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 weak soil. The 24-in. and 36-in. footings were rocked over without significant damages as expected, while the 60-inch 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 stirrups in the 60-inch 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 new 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."

University of Nebraska MATC Affiliated Faculty, Research Staff, & Partners



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Kansas State University Consortium Partner Highlights at a Glance



Letter from the Associate Director - Dr. Mustaque Hossain

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.

Kansas State University Research Projects

- Vulnerable Road Users: Case of the Motorcyclists**
- Assessing the Damage Potential in Pretensioned Bridges Caused by Increased Truck Loads Due to Freight Movements (Phase 2)**
- Extending Asphalt Pavement Life Using Thin Whitetopping**

For project details see page **46-47**

Matching Funds Provided by:



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. Klaasmeyer Chair in Engineering and Technology at UNL, Laurence Rilett, 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. Three 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.

Kansas 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 1)

"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 11 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."



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

"Ms. Sharmin 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 2)

"Mr. Hammerschmidt is working under Dr. Bob 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-tensioning 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 he 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 linear regression model relating these factors and motorcycle fatalities to see how these factors contribute to an increase in the severity of motorcycle crashes."

Kansas State MATC Affiliated Faculty



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University of Iowa Consortium Partner Highlights at a Glance

Letter from the Associate Director - Dr. Paul Hanley



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 operations. 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 Stoner 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 Crammer 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 Research Project

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

For project details see page 49

Matching Funds Provided by:



University of Iowa Education Program

The University of Iowa created two new transportation courses. The first of the courses was taught by Professors James Stoner and Paul Hanley and titled "Public Transportation Operations and Planning." This course drew eighteen students, two of whom were undergraduates equally from the Departments of Civil and Environmental Engineering in spring 2009. The success of the course has led the Department of CEE to adopt it permanently into its curriculum. The second course, prepared by Professor John Fuller and Adjunct Lecturer Bart Cramer, is titled "Freight Planning and Policy." This course will be offered in fall 2009 and is directed toward graduate students in engineering, planning, geography, business, and economics. The early enrollment is high.

The outreach efforts of the University of Iowa's Women in Science and Engineering (WISE) were supported by MATC as well, which allowed WISE to increase the number of contacts made with high school students this year.

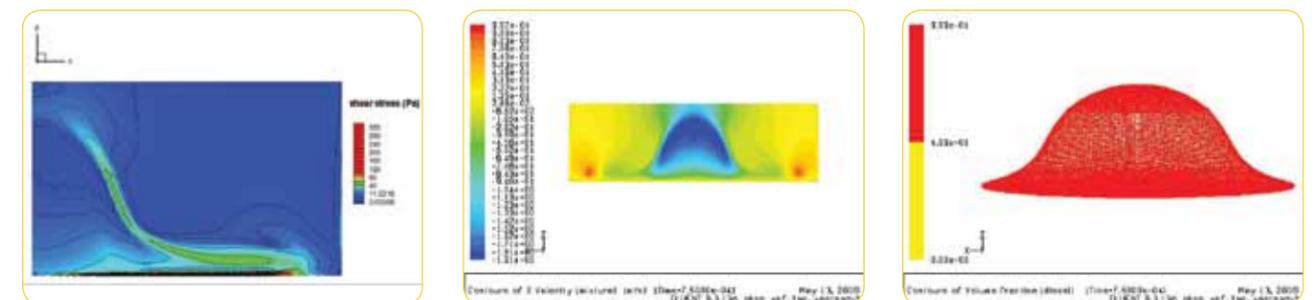
MATC support allowed students from the University of Iowa to attend the third annual Moving Iowa Forward Conference, sponsored by Iowa's Departments of Economic Development and Transportation. The conference brought together users and providers of the transportation industry – trucking, barge, and rail – and economic development officials who interact with the users and providers in the transportation industries.

In FY2009, MATC co-sponsored the inaugural symposium in the Forkenbrock Series on Public Policy, which was titled

"Transportation Finance and Economics: Policies for the Future" and held at the University of Iowa in Iowa City, Iowa, on September 11-12, 2008. The symposium featured a blend of national experts from government, practice, and academia presenting on issues concerning transportation finance. The MATC sponsorship made it possible for over 24 graduate and undergraduate transportation students to attend the two days of sessions. We also supported the travel for a student to attend and present a paper last October at the TRB's "Impact of Changing Demographics on the Transportation System" Conference. In addition, we offered support for student travel for those who presented at the TRB annual meeting in January.

In cooperation with the Forkenbrock Series on Public Policy, MATC is co-sponsoring a nationwide college student competition during the 4th National Conference on Financing Surface Transportation in the United States. The competition winners will open each plenary session by presenting their work. We will also be running a K-12 outreach program at our conference host site of New Orleans. The school children will be invited to present the results of their work during an afternoon reception.

We are continuing to facilitate the outreach efforts of WISE and other organizations at the University of Iowa to increase the interest in transportation among a broad spectrum of students. Our commitment to assisting students in gaining exposure to transportation professionals remains strong, and we will try to create as many opportunities for them to present their work at conferences and other meetings as possible this year.



Pictures above represent shapes of a diesel droplet in different time steps. These photos are from experiments and simulation results.

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."



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."

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."



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University of Kansas Consortium Partner Highlights at a Glance

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 (KU) 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—so-called 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 in Atlanta on “DEM Analysis of Geotextile-soil Interaction under Wheel Loading,” and two other graduate students presented a paper on “Experimental Study of Bearing Capacity of Geocell-Reinforced Bases” at the University of Illinois.

We are happy to report an excellent placement record for engineering students coming out of KU. Chen Fei See, a May 2008 M.S. graduate, took a job with PSI Consultants in Washington, D.C. Kim Jackson, a May 2009 M.S. graduate, took a new job with Mason and Hanger. Three May 2009 graduates

are now employed with KDOT: Colby Farlow, Thomas Husa, and Emily Humbarger. Undergraduate involvement in MATC-related work has also been strong. Dr. Steven Schrock had several undergraduate students working for him last academic year. Cheryl Bornheimer is staying on for graduate work. Matt Henshaw is interning with KDOT this summer and plans to work at KDOT after graduating in December. Six other KU undergraduates interning this summer with KDOT are Lucy Munz, Carl Schwarzer, Ryan Haggerty, Brad Ikenberry, Kory Rankin, and Joe Deneault.

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.

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

For project details see pages 48-49

Matching Funds Provided by:



KU MATC Education Program

MATC-funded educational activities at the University of Kansas increased in FY 2009. Three Civil Engineering undergraduate students were selected as Undergraduate Transportation Scholars and they had their way paid to the annual TRB meeting in Washington, D.C.

The Student Chapter of ITE was very active this year. For example, Hugh Kierig from the PRT System on the West Virginia University Campus was invited to speak on campus. The ITE Student Chapter had six other meetings with an average attendance of 22. It did help that food was provided during the lunch-time meetings.



Four students and Dr. Schrock attended a lecture by Bill Graves, a former governor of Kansas and the President and CEO of the American Trucking Association.

Four students and Drs. Schrock and Mulinazzi took a field trip to the BNSF's Argentine classification yard in Kansas City. The KU group was allowed into the control tower to watch how the railcars are redirected into trains headed for the same destination. Another field trip was taken to the headquarters of the SCOUT program in Kansas City. SCOUT is an ITS network set up to help control traffic on the freeway system in the Kansas City Metro area.

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.

KU MATC Tech Transfer Activities

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 students 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 Track 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."



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."

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."

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."

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Missouri University of Science & Technology Consortium Partner Highlights at a Glance

Letter from the Associate Director - Dr. Genda Chen



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 participated in that program in Summer 2009 have been selected for MATC Scholarships. In addition, one graduate fellowship was established to increase the participation of U.S. students in transportation research.

Missouri University of Science & Technology Research Project

Validation on the Mechanical Models of Asphalt Pavement Structures with Field Measured Data Associated with Increasing Freight Movements

For project details see pages

47

Matching Funds Provided by: In-Kind Faculty Support



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 undergraduate students 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.

Missouri S&T MATC Students Working on Research



Cheng Chen, Ph. D.
 Graduate Research Assistant, Civil, Architectural, and Environmental Engineering
Project: Validation on the Mechanical Models of Asphalt Pavement Structures with Field Measured Data Associated with Increasing Freight Movements

"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."



Iana Muchaidze, MS.
 Graduate Research Assistant, Civil, Architectural, and Environmental Engineering
Project: Validation on the Mechanical Models of Asphalt Pavement Structures with Field Measured Data Associated with Increasing Freight Movements

"Ms. Muchaidze was currently added to the project listed."

Missouri S&T MATC Affiliated Faculty & Partners



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ADVISORY BOARD MEETING 2009 FUNDED RESEARCH PROJECTS

First Annual MATC Advisory Board Meeting



MATC Advisory Board and Associate Directors. Top row, L-R: Ty Westergaard, Ray Moore, Mustaque Hossain, Dick McReynolds, Dave Connell, Larry Rilett, Mark Stiles, and Tom Mulinazzi. Bottom row, L-R: Dean Sicking, Andy Nowak, Bob VanderClute, E. Dean Carlson, Paul Hanley, Moe Jamshidi, David Sehart, and Dan Murray.

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 trucking, 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.



Pictured above are photos taken at the live crash test and individuals involved in the tours provided to the MATC Advisory Board Members.

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.



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 Admiraal, Associate Professor, Civil Engineering, University of Nebraska—Lincoln; Dr. Tian Zhang, Civil Engineering, 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.

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 Bielenberg, Research Associate Engineer, Midwest Roadside Safety Facility, 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.

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.

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.

Truck Safety at Railroad Crossings

PI: Dr. Aemal Khattak, 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 26% 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.

MATC Research Projects Funded in Fiscal Year 2009

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 transmissions' 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 itself, 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.



Validation on the Mechanical Models of Asphalt Pavement Structures with Field Measured Data Associated with Increasing Freight Movements

PI: Dr. Yu-Ning Ge, Assistant Professor, Civil, Architectural and Environmental Engineering, Missouri University of Science & Technology

Co-PI: Dr. Genda Chen, Professor, Civil, Architectural and Environmental Engineering, Missouri University of Science & Technology

DESCRIPTION: This proposed study is aimed at better understanding the effects of heavy trucks on the performance of asphalt pavements. Sufficient field performance data will be collected in this study, and this data will then be used to validate the Mechanistic Empirical Pavement Design Guide (MEPDG) and the finite element method (FEM) in terms of the impact of heavy truck loading on pavement performance.

BENEFITS: The project will provide a better understanding of the effects of heavy truck loads on the overall structural performance and life of pavements, and allow for a more appropriate implementation of the MEPDG into pavement designs with further research issues identified, as well as for the potential development of a damage detection method.



MATC Research Projects Funded in Fiscal Year 2009

University of Kansas Projects



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 unexpected queuing. The rumble strip unit could be an effective method of alerting drivers that they are approaching the work zone.

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 Mulinazzi, Professor of Civil, Environmental, and Architectural Engineering, University of Kansas; Dr. Steven Schrock, Assistant Professor, 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.

Mitigating Wind-Induced Truck Crashes

PI: Dr. Thomas Mulinazzi, 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.

University of Iowa Projects



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.



MATC SUMMER INTERN PROGRAM
UNL MATC INTERNS
STUDENTS OF THE YEAR
INTERN AWARD RECIPIENTS
MS&T INTERN PROGRAM
MATC GRADUATE STUDENT COLLABORATION
LINCOLN MATH TEACHER AWARD
MATH & SCIENCE SUMMER INSTITUTE
MCMILLAN MIDDLE SCHOOL VISIT



The 2009 UNL MATC interns met with representatives of their sponsoring firms and agencies and with the faculty coordinator, Karen Schurr (far left).

2009 MATC Summer Intern Program

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.



2008 MATC Student of the Year

Robert Rescot

MATC is proud to announce Robert Rescot as the 2008 student of the year. Rescot is a second-year Ph.D. student in transportation engineering at the University of Kansas (KU). He is originally from the St. Louis, Missouri area, and has previously received a bachelor's degree in civil engineering 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. course work. 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.



2008 UNL Student of the Year

Jennifer Schmidt

The Mid-America Transportation Center selected Jennifer Schmidt as the 2008 UNL student of the year. Schmidt is currently working on her master's degree in civil engineering at the University of Nebraska - Lincoln. She is a graduate research assistant at the Midwest Roadside Safety Facility, and her research focuses on the safety performance of work-zone traffic control devices with new safety standards. She received her bachelor's degree in civil engineering from the University of Nebraska - Lincoln. In the summer of 2007, she expanded her educational horizons on a study abroad trip to Brazil, where she took an engineering class. Schmidt plans to pursue a career in the structural design of buildings. Her academic honors include being a University Regents Scholar and graduating from the Honors Program.

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 flooded 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."



Derek Nieveen

Iteris, Inc., Intelligent Transportation Systems and Traffic, Lincoln, NE

"The reason I reapplied to the MATC internship at Iteris, 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."

Joshua Redwine

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

"As a second-year MATC intern I'm beginning to see that reality is nothing like what we've learned in controlled classroom environments and in our text books. When we enter the real world it will be up to innovative thinkers like us to meet the challenges of our time. With the experience I've gained in the past two years coupled with my college education, I feel that I am ready to broaden my horizons and meet the challenges of our constantly changing world."



Jacob Reinig

Kimley-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."



Intern Award Recipients



Most Informative Presentation

Adam Denney

Felsburg, Holt, and Ullevig, Traffic Engineering, Omaha, NE

"Interning at FHU has given me a glimpse of what it means to be a transportation engineer and reinforced my decision to pursue transportation as my career path. It has been a great environment for me to work, learn, and build relationships not only with my coworkers, but clients as well. I have worked on traffic impact analyses, interstate justification reports, and a variety of other engineering-related tasks. I am grateful for the opportunity and would like to thank FHU and MATC for this experience."



Best Report

Jacob Miriovsky

Nebraska Department of Roads, Traffic Engineering, Lincoln, NE

"My MATC internship has been a tremendous learning experience. While working for the Nebraska Department of Roads, I learned all the details about the organization that paves our way to and from almost everywhere we go in Nebraska, including the studies and projects that go into making the roads we all drive safer. A majority of my time was spent analyzing 55 mph rural two-lane highways in an effort to increase the speed limit to 60 mph. This was a great experience knowing my studies will have an impact. Everything I've learned is sure to be beneficial in my future plans for a career in transportation engineering."

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.



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 61 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 through all of my materials classes in school, but I feel like this internship has prepared me for my classes this fall.

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.



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.



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.



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 Moreland

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.



Missouri S&T Intern Program



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.

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.



Aaron Trenshaw

Materials Intern

What I liked best about my summer internship was the variety of tasks that kept the job interesting and challenging. I was given many opportunities to work with different people doing very different things. I felt as though I had the respect of the people who I worked with, and I enjoyed taking more responsibility and

growing as an employee. The whole experience was a lot of fun and I learned a lot.

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.



Samuel Vance

Construction Intern

Working out of a construction office has been a wonderful and enlightening experience. Aside from practical engineering knowledge obtained, one of the

most beneficial things I learned is the dynamic between the inspector and the contractor and the often conflicting goals of each. This is experience that cannot be fully taught in a classroom, and I wouldn't have been able to witness this if it hadn't been for the internship.

Additional Missouri S&T/ MoDOT Interns Summer 2009

Andrew Westermier Construction Intern

Joseph Ridpath Construction Intern

Michael Dahm Construction Intern

Joshua Lix Construction Intern

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 CJ Hsu and Hang Yue. Robert Rescot, 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 M.S. It was an excellent evening full of fun, fellowship, and exciting ideas for future collaboration.



2009 Professional Development Science and Math Summer Technology Institute at UNL



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 test 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 UP tour, the group was met at the recently renovated Harriman Center by Greg Garrison, Western Region General

Supervisor, and Stan Vannier, Systems Development Manager, who explained the work of the train dispatchers—visible from the visitor gallery through glass walls—and answered the teachers' numerous questions about the company and the career paths of their employees. At Werner Enterprises, institute participants attended presentations by Stefanie Christensen, HR Manager, and Amy Holmes, Training and Development Manager, which were tailored specifically to the teachers' interests and highlighted information about the company and its trucks that lends itself to being incorporated into math and science assignments. After the presentations, a training coordinator showed the visitors how a truck is scaled and how the weight of the load is evenly distributed, and several volunteers had the chance to ride in one of Werner's trucks.

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 intricate pulley system. As Jesse Andres, one of the participating teachers from Goodrich Middle School in Lincoln, commented, this tour was especially inspiring to him since it provided him with ideas he would like to pursue in 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 in 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.



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 quotients and integrals. That ability to teach students how math relates to their world, is what math department chairman Tom Ahlschwede says makes Welker a great teacher. It is also the quality that helped Welker earn the Presidential Award for Excellence in Mathematics and Science Teaching, the nation's highest award in those fields.

Excellent teachers like Jerel Welker play a crucial role; not only do they impact students' future interests and careers, but they also benefit the nation by encouraging innovative thinking in tomorrow's leaders.

Ahlschwede confirms that Welker is such a leader, someone who "incorporates technology and the real world and demonstrates how pre-[calculus] relates to physics, science, and to things you see every day."

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.

Welker received \$10,000 from the National Science Foundation, one of ninety-nine recipients from across the country who all teach math and/or science to students

Pictured above are diagrams used in Jerel's lesson plan. In his award application he used lesson plan materials developed during the summer institute.

from the 7th through the 12th grades.

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 since 2004.

More from the 2009 Professional Development Science and Math Summer Technology Institute

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 "Educating Diverse Audiences" on June 19, engaging both the Lincoln and the Omaha groups through interactive assignments and questions 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 benefitted from previous internships, and he expected this experience to be of similar benefit to him. Rich Powers from Lux Middle School also commented positively on the institute, which he said he applied to because he wanted to expose himself to new research and ideas for creating interesting lessons for his students, since he has been teaching the same curriculum for the last eighteen years. Some of the teachers also expressed their interest in reapplying next year, further underlining how useful the experience was to them this year.

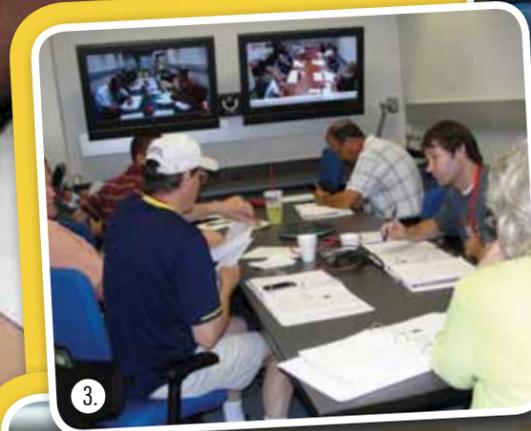
For the second part of the summer institute from July 15-17, 2009, about ten of the teachers returned to the Lincoln and Omaha campuses of the University of Nebraska, where, with the help of the peer teachers and about twenty students, they tested the lesson plans they had been developing since the beginning of the summer program. The students, who are invited to this so-called "Engineering Experience Day" at the university each year as part of the institute, spend a day visiting different classrooms

in small groups, where the participating teachers have prepared science experiments and presentations for them. In Jesse Andres' classroom, for instance, rotating groups of about four to five students learned about levers and the effect that moving the fulcrum has on their balance. Through practical demonstrations and hands-on experimentation—for example, one student project involved balancing a meter stick (ruler) on a pencil and placing pennies of various weights and sizes on the ends to determine the moving location of the fulcrum—Andres was able to engage the students directly and to raise their interest in what might have otherwise been simply an abstract concept to them without any real-life applicability. He also incorporated examples that he had encountered during his tour of Werner Enterprises from the previous month into his presentations, explaining how the load of a truck must be balanced with the help of a movable fulcrum.

Following the teachers' presentations on July 16, the students visiting the Lincoln campus witnessed a live crash test, toured several engineering labs, and visited a "Road and Rail" Mobile Training Lab, generously provided through the combined efforts of Central Community College in Hastings, Nebraska, and Mid-Plains Community College in North Platte, Nebraska. Only six of these highly sophisticated labs exist in the United States, as Dave Engel, Project Coordinator for Central Nebraska Transports the Future, explained, and the state-of-the-art train, flight, and motor vehicle simulators impressed the visiting students notably.

Continuing the success of previous years, the fourth Professional Development Science and Math Summer Technology Institute met with praise from the participating teachers, who especially appreciated the informative presentations by engineering researchers and the inspiration provided by the tours of leading transportation companies. The lesson plans they created testified to the enthusiasm and creativity inspired by the activities of the summer institute, which they in turn passed on to the visiting students, who seemed to enjoy the chance to learn about real-life transportation issues through hands-on experimentation very much.

Background image: a middle-school student tries her hand at the Road & Rail motor vehicle simulator; Below pictures from left to right: 1. Students on their visit to the museum at Werner Enterprises; 2. students touring structures lab; 3. video conferencing technology allowed the teachers in Lincoln and Omaha to communicate with each other in real time; 4. train dispatchers at work at Union Pacific's Harriman Dispatching Center; 5. the Mobile Training Lab provided by Central Community College and Mid-Plains Community College.



This research project involves the collaborative efforts of:



Omaha's McMillan Middle School Students Visit MATC

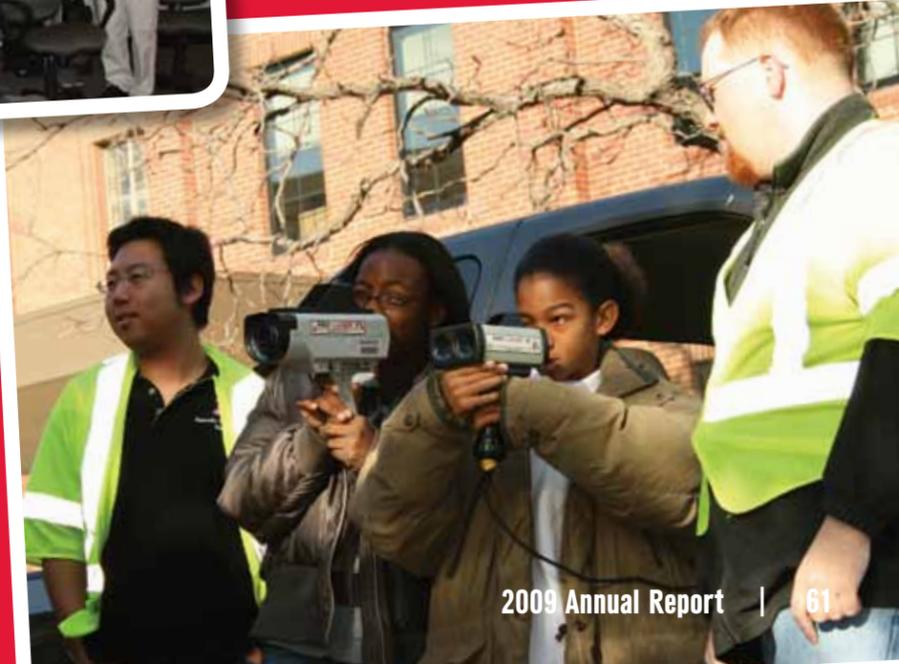
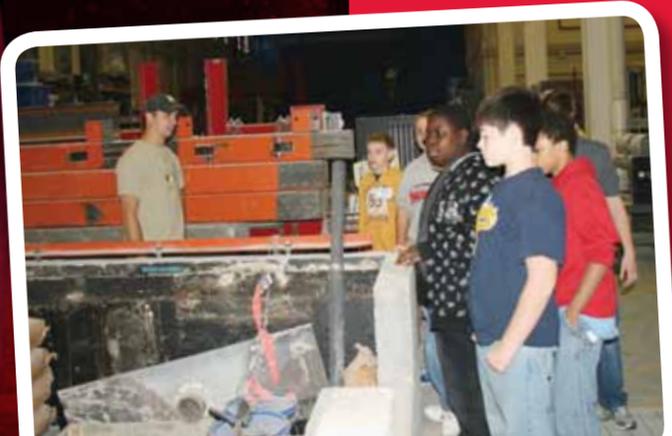
Forty seventh-grade students from McMillan Magnet Middle School (Omaha Public Schools) visited the Mid-America Transportation Center at the University of Nebraska-Lincoln on an engineering field trip designed to familiarize the students with important practical applications of engineering research and 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.



McMillan students visited the Structures lab and viewed the steel girters 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.

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.



TECHNOLOGY TRANSFER

USDOT RITA Site Visit to MATC
Union Pacific Tour
TRB 88th Annual Meeting
ITS Heartland Annual Meeting
ITS Training Workshop



MATC Hosts USDOT Research and Innovative Technology Administration Grant Administrators

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.



Mr. Rodrigo Franca, IMSE Logistics Graduate Student discusses MATC-RFID research with Ms. Lydia Mercado.



Mr. CJ Hsu, CIVE Transportation Graduate Student presents MATC-ITS research to USDOT Grant Administrators.



MATC Students and Faculty Tour Union Pacific's Dispatching Center and Track Renewal Train Facilities



As part of the Missouri Valley ITE meeting on September 24, 2008, MATC graduate and undergraduate students were given a tour of the Union Pacific Harriman Dispatching Center in Omaha, Nebraska by Steve Barkley, vice president of the center and of Network Operations with Union Pacific (UP). The Harriman Dispatching Center (HDC) was recently remodeled with state-of-the-art technology, including biometric security on the doors, ergonomic lighting, and cutting-edge sound control with an acoustic cloud throughout the HDC. The first train was dispatched from the newly remodeled center in February of 2008. Equipped with today's advanced technology and software, the dispatch center coordinates up to 2,000 freight and metro trains simultaneously on over 25,000 miles of track.

Network surveillance feeds real-time data into various maps and graphs displayed on the walls of the dispatch center and utilized by the dispatchers. This system allows UP to increase its rail network velocity, improve car cycle times, and save fuel, among many other benefits. The new system also integrates mainline and terminal planning in order to improve utilization of locomotives, cars, terminals, and crews.

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 (tornadoes, hurricanes, 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 quickly, safely, and efficiently through the rail system.

One month later, in October 2008, Union Pacific hosted another group of visitors from UNL, as civil engineering students and faculty members took advantage of a unique opportunity to view UP's track renewal train, the TRT 909, by traveling to the site of its operation on a field trip organized by the Institute of Transportation (ITE) and the American Society of Civil Engineers (ASCE). A total of twenty-one participants, including graduate students, undergraduate students, and faculty members, went on the trip, which took them to an area between the towns of Silver Creek and Clarks in Nebraska.

The tour began at Duster's restaurant in downtown Columbus, where Union Pacific's Kevin Hicks, Jay Farrar, and Drew Bokenkamp gave attendees a brief presentation on the history of Union Pacific and the background of the renewal train. Hicks also provided the students in attendance with information on jobs with Union Pacific that would be available in the future.



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 rails and ties in one swoop, 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 ties per minute.

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.



MATC Students Attend the TRB 88th Annual Meeting



2009 MATC Student of the Year, Robert Rescot, meets former U.S. Secretary of Transportation, Norman Mineta.

From January 11-15, 2009, seven graduate students from the University of Nebraska—Lincoln (UNL) and the University of Kansas (KU), as well as a number of undergraduates selected as part of the MATC-funded KU Undergraduate Transportation Scholars Program, attended the 88th annual meeting of the Transportation Research Board (TRB) in Washington, D.C. thanks to generous funding by MATC through a USDOT grant. The TRB annual meeting is one of the largest in the transportation field and the 2009 meeting featured more than 3,000 presentations with over 10,000 transportation professionals from around the world in attendance. The 2009 spotlight theme was "Transportation, Energy, and Climate Change," and a large number of the presentations highlighted the relevance of transportation research for the increasing energy and climate challenges the world faces today.

For many of the UNL and KU students attending the conference, one of the most interesting and rewarding experiences of the meeting was making the acquaintance of important researchers in their field of study whom they had not met before, or with whom they had previously only corresponded by email. Others cited the opportunity to learn about the latest practical advances in engineering around the world as a highlight that confirmed their personal interest in transportation engineering. Donnie Butler, an M.S. student from UNL, also praised the webcasts of select sessions from the annual meetings that TRB has been making available in electronic format on its website since 2005. Though not substitutes for the conference experience itself, these e-Sessions are an excellent resource for those interested in concurrent presentation sessions or those unable to attend the meeting. For Robert Rescot, a Ph.D. student from KU who was selected as the 2008 MATC student of the year, 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 Holds Its Tenth Annual Meeting



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. Following introductions and a welcome note from Deb Miller, Secretary of the Kansas Department of Transportation, on Tuesday morning, the participants dispersed to attend concurrent presentation sessions on topics as varied as "Using ITS When Disaster Strikes" and "Building Partnerships for the Future of ATIS."

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 Training Workshop on Systems Engineering

ITS Heartland hosted 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 Volz of Telvent Farradyne, Inc. for his coordination with ITS America.



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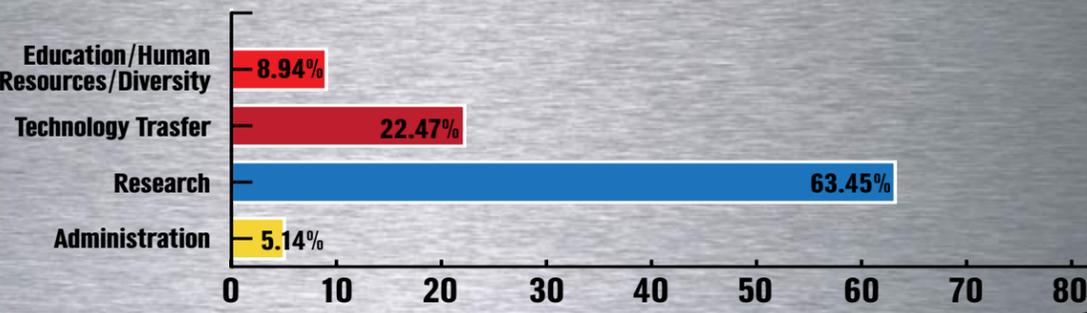
Technology Transfer



MATC Financial Information for FY 2009

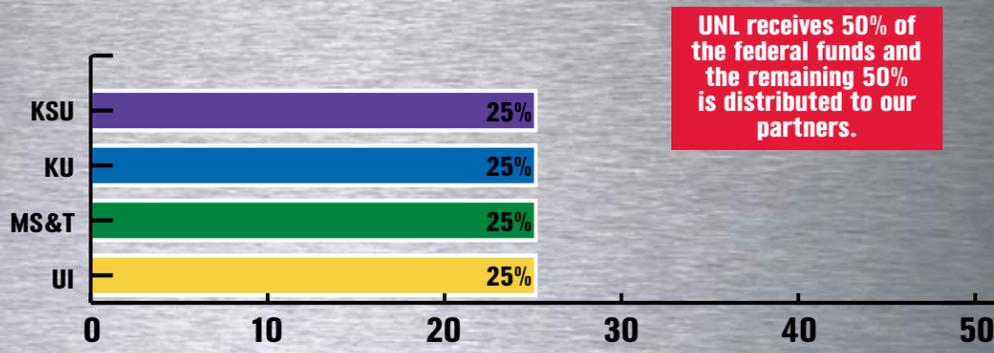
Planned Expenditures

Funds Allocated for Education, Research, Administration & Technology Transfer



Distribution of Federal Funds to Partners

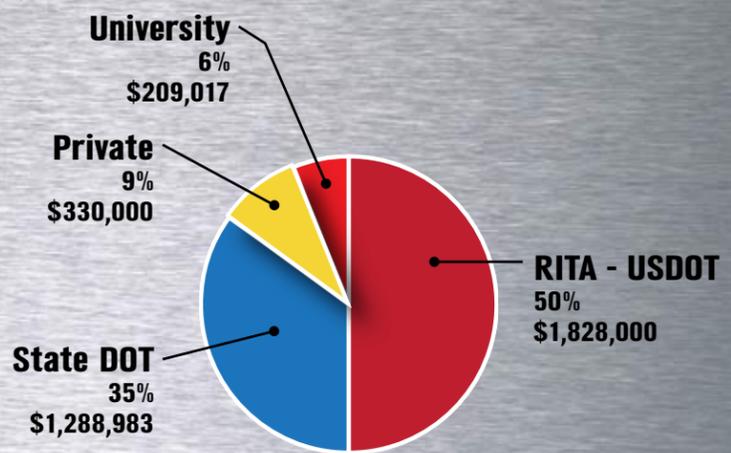
TOTAL = \$914,000



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



For More Info:

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