Vol. 4, No. 1
April 2010

Region 8

MOUNTAIN-PLAINS CONSORTIUM NEWS

PROJECT HIGHLIGHTS

Mechanistic Empirical Pavement Design Guide implementation in the northwest region

The University of Wyoming recently began a study to evaluate the implementation of the Mechanistic Empirical Pavement Design Guide (MEPDG) in the northwest region of the United States.

Current pavement design methodology based on the American Association of State Highway and Transportation Officials (AASHTO) Design Guide uses an empirical approach based on the results of the AASHTO Road Test conducted in 1958. But limitations of the current guide led AAHSTO to develop the new MEPDG, which combines the mechanistic and empirical methodology by making use of calculations of pavement responses such as stress, strains, and deformations while using site-specific inputs from climate, material, and traffic properties.

"As a new design guide and with large data inputs required, there are bound to be challenges," notes Khaled Ksaibati, MPC program director in Wyoming and professor of civil engineering at the University of Wyoming. "Consequently, the MEPDG is currently undergoing a lot of changes with further research being conducted at the national, regional, and local levels into various aspects guide, especially in the areas of materials, climate, and traffic characteristics. It is hoped that the findings from the various research studies will facilitate the implementation of the MEPDG at the national, regional, and local agencies."

The University of Wyoming has completed the first report from this study which identified the challenges to implementing the MEPDG in the northwest region. In addition, the report identified specific areas of needed research. A second report is being prepared to demonstrate the utilization of environmental data in the implementation of the MEPDG in Wyoming. It is anticipated that more regional efforts will be undertaken by MPC to facilitate the regional implementation of MEPDG.

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Colorado State University • North Dakota State University
South Dakota State University • University of Utah • University of Wyoming

CSU researchers examine coal-based energy by-product for use in concrete

Spray dryer ash is a by-product of coal-based energy production. Disposal challenges associated with the by-product and the economic and environmental costs linked to Portland cement production inspired MPC researchers at Colorado State University to learn if spray dryer ash can be used to replace part of the cement in concrete.

The use of waste products such as fly ash in concrete has been studied extensively and results indicate that the fly ash improves numerous concrete properties. Spray dryer ash is similar to fly ash in many ways and most closely resembles class C fly ash. It is a relatively new product resulting from the use of scrubbers at power plants and little research has been done on its application. Researchers based their research on the hypothesis that spray dryer ash would perform similarly to class C ashes.

"We wanted to demonstrate whether it was feasible to use spray dryer ash as a partial replacement for Portland cement," explained CSU researcher Rebecca Atadero. Ash obtained from a local power plant was used in concrete mixes as a partial replacement of the cement (binder) and fine aggregate (filler). Several design mixes with SDA contents ranging from 0-50% were prepared, cured, and tested for their compressive and bond strengths, durability (freeze-thaw), and corrosion properties.

The results were analyzed and compared with standard concrete.

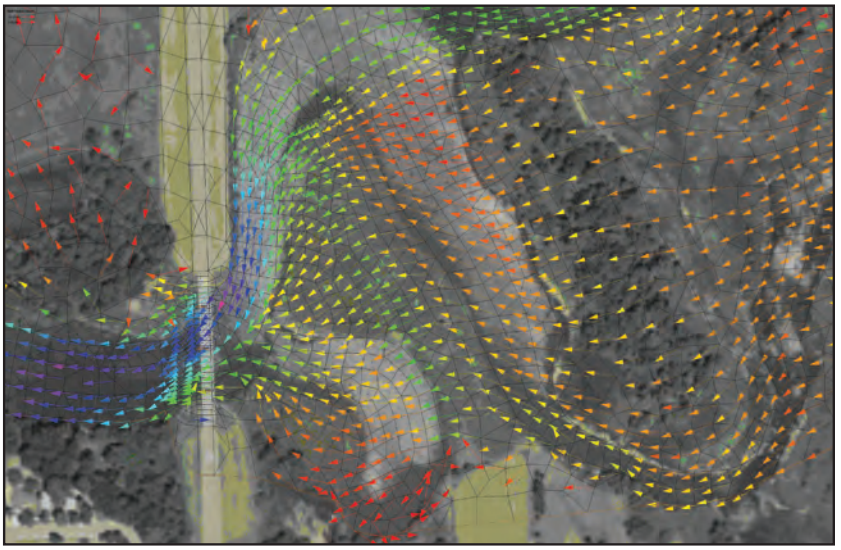
The results of the compressive strength tests showed a general increase in the ultimate strength of concrete with addition of SDA with the best strength results obtained at 25% to 35% of cement replaced with spray dryer ash. Beyond 35%, a reduction in the rate of strength gain was observed, but mixes were still able to achieve the required design strength. The addition of SDA also resulted in slightly higher bond strengths. The freeze-thaw test results indicated that replacing proportions of cement with SDA required more air entrainment admixture to achieve the same amount of entrained air, but otherwise utilization of SDA produced a negligible effect on the freeze-thaw durability of the concrete. Corrosion properties of the SDA concrete and control concrete were also similar.

"In general, the addition of SDA provided modest benefits when used in certain proportions and portrayed great potential for its utilization as a structural material in transportation infrastructure," Atadero said.

Mixing concrete cylinders. Carolyne Namagga and Kyle Weighaus.

SDSU researchers use flow modeling to learn how flow conditions produce bridge scour

MPC researchers at South Dakota State University are using field measurements and 2-D flow modeling to gain insight into the different types of flow conditions that produce bridge scour.



Velocity vectors from a 2-D flow model of the Highway 13 Bridge over the Big Sioux River near Flandreau. The discharge is 9,090 ft3/s (Q100 = 31,300 ft3/s). A local scour depth of 8.5 ft was measured at the northern-most pier after the flood. River crossing at a sharp bend in conjunction with interaction of flow between the main channel and left overbank create complex flow conditions at this site, which cannot be predicted using a 1-D model such as HEC-RAS.

Beginning last summer, researchers studied the flow concentration around a sharp bend at the Flandreau bridge site that has produced large measured pier scour. This summer, they will study a second bridge site where contraction scour was observed. Results of these studies would allow researchers to develop procedures and guidelines that engineers can use to improve hydraulic analysis of bridge waterways with complex channel and floodplain geometry.

Bathymetric and topographical survey was conducted at the Highway 13 bridge over the Big Sioux River near Flandreau in August 2009 (see December 2009 newsletter). A two-dimensional (2-D) flow model of the bridge site was completed in February 2010 and validated using field measurements of flow velocity and water surface elevation. The model was run for a range of flow discharges ranging from low flow to the 100-year flood. The computed results were used to better understand the hydraulics at the bridge site.

Local scour at bridges include pier scour, abutment scour, and contraction scour. Accurate results on lateral distribution of flow both upstream and at the bridge are important for reliable prediction of bridge scour depths.

The project is co-sponsored by the MPC and South Dakota Department of Transportation. Francis Ting, professor of civil and environmental engineering from SDSU, is leading the effort. Graduate research assistant Ryan Larsen of Elk Point, SD, is assisting with the project. Larsen will graduating in May 2010 with a master's degree in civil engineering . He plans to work as a hydraulic engineer with the U.S. Army Corps of Engineers in Omaha, NE.

NDSU research evaluates strategies to enhance safety on rural roads

North Dakota rural roads have a relatively high level of crashes and injuries. In fact, nearly 9 of every 10 of the state's fatal crashes take place on rural roads. Researchers at NDSU are attempting to cut those numbers by identifying strategies that work best at encouraging drivers and their passengers to use seat belts.

State and federal safety initiatives have been directed at rural roads. NDSU researcher Andrea Huseth notes that an important aspect of those initiatives is to understand the effectiveness of individual and coordinated safety interventions. "There are limited resources available to direct at safety concerns, we need to assure that we are using them in an effective and integrated way that has the largest impact on safety.

The project will measure effectiveness for alternative levels of intervention designed to heighten awareness and safety on rural roads in a targeted corridor. Specific objectives, activities, and participants will be determined in a cooperative project planning group. The primary focus will be on seat belt use in rural areas as crash records and law enforcement observation suggests that lower rural-area use is critical traffic safety issue. In addition, seat belt use is documented in crash records, the annual statewide survey, and local seat belt events. Road departures, rollover crashes and speeding may also be considered as a focus.

Huseth notes that a multi-county case study will be designed to include single event, sustained, and multifaceted safety interventions. Three or four counties will be selected for intervention within a corridor, with another county beyond the corridor monitored as a control case. The researchers will consider seat belt use, crash numbers, and moving-violation citations as safety metrics.

Initially, suggested safety interventions include three levels:

1. Traditional, single event, two-week high visibility enforcement seat belt campaign with enforcement and media.

2. Sustained, ongoing effort, in periodic HVE seat belt enforcement or sustained seat belt emphasis through an extended time period.

3. Enriched, sustained, traffic safety effort to include sustained seat belt enforcement along with education events that may include school symposiums, business workshops, car seat checks, seat belt checks, and engineering contribution such as traffic safety evaluations.

"This research should help us better understand how to assemble various safety intervention strategies in a way that is most effective," Huseth says.

Wyoming researchers develop gravel roads management methodology

A project is under way at the University of Wyoming to address the lack of a dirt and gravel roads management system (GRMS) for small local governmental agencies, such as rural counties. The Wyoming Technology Transfer (T2/LTAP) Center met with and solicited input from numerous experts in the fields of gravel roads and roadway management, 54 of whom participated in this project in one way or another.

A review of the published literature revealed a number of efforts to manage unsealed roads in various circumstances, while further investigations revealed other unpublished management efforts. In spite of this, no methodology was discovered that is well-suited to small, local agencies. Existing methods generally use considerably more data inputs than are available to or easily obtained by most counties of the rural west.

Before undertaking improvements to a GRMS, the current situation should be assessed, including evaluations of both the agency's current gravel roads information management processes and the resources available to improve the situation. By looking at various resources, both financial and otherwise, the potential for improvement is assessed, and the best ways to proceed are determined.

Two basic outputs from a gravel roads management system (GRMS) have been identified. First, a GRMS should provide elected officials with useful information that lets them make good financial decisions. Second, it should provide road managers with information that helps them maximize the efficiency of unsealed dirt and gravel road maintenance and rehabilitation. Two hurdles to addressing these needs are the lack of a suitable methodology for managing gravel roads and the lack of resources needed to collect adequate data. This project defines ways to deliver the desired outputs in spite of these difficulties.

Implementation processes are identified. Three basic management functions are described: inventory; cost and maintenance tracking; and condition monitoring. With each of these elements, considerable benefits may be realized, but additional effort is needed.

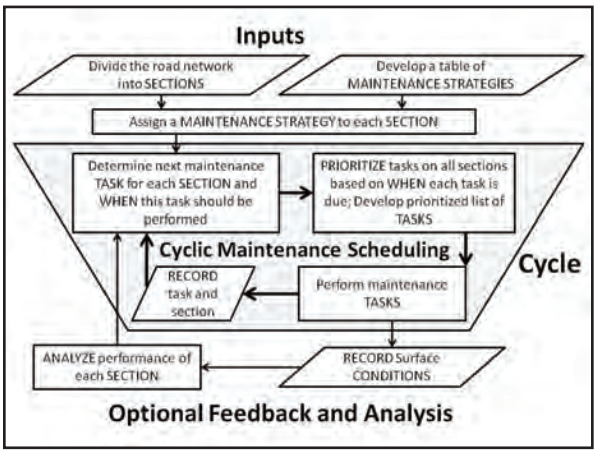
An element of many local agencies' information management that appears to impede unsealed roads' management is the use of accounting line items to track maintenance costs. To address this problem, the group of experts came up with a list of maintenance tasks (very similar to one put forward in the early 1990s by the National Association of County Engineers) to which unsealed road costs should be assigned. Specific task definitions and a flow chart for determining which task a given cost should be assigned to are provided. Using these tasks will allow agencies to more effectively track and program their maintenance and rehabilitation operations.

These maintenance and rehabilitation tasks are:

- Blading
- Reshaping
- Drainage Maintenance
- Regraveling
- Dust Control
- Stabilization
- Isolated Repairs
- Major Work

Another issue that makes managing unsealed roads more difficult relates to the collection of useful performance data, largely due to the rapidly changing nature of dirt and gravel roads. Though collecting valuable performance data is problematic, it is also an essential element of a well-developed GRMS. Solutions to this problem are proposed, ranging from automated data collection to agency employees performing visual surveys as part of their routine activities.

One benefit that may be derived from taking these gravel roads management steps is the implementation of a cyclic maintenance process which may be used to program maintenance tasks in a more cost-effective manner, allowing for consideration of both user and agency costs. The figure illustrates this process:



By establishing minimum acceptable driveability standards for every section and by monitoring surface conditions when maintenance is performed, maintenance frequencies can be adjusted to reflect the performance and needs of each road section within an unsealed road network.

(gravel roads continued on page 6)

(gravel roads continued)

Finally, two guides are being developed as part of this project, an "Implementation Guide" and a "Programming Guide." They provide comprehensive advice and guidance to road managers and those working with them to develop a GRMS, presenting the information as clearly and concisely as possible. The "Implementation Guide" provides local road managers with advice on implementing and upgrading gravel roads management practices, while the "Programming Guide"' provides information for data managers and programmers. These guides will provide valuable information and advice for those managing dirt and gravel roads both in Wyoming and around the world.

Highway safety screening tool for South Dakota

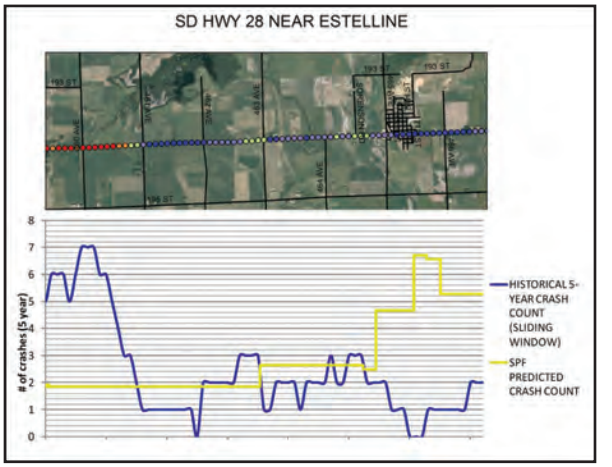
Xiao Qin, an SDSU professor in civil engineering, and Adam Wellner, a master's student at SDSU, are developing a highway safety screening tool for the state of South Dakota.

Their objective is to develop a data-driven, performance-based highway safety analysis tool that can screen selected rural highways using a collection of statistical, computer, and GIS techniques. It is a system-wide approach that can be used to effectively and accurately identify high-crash locations based on a suite of comprehensive safety performance measures in the context of rural roads.

South Dakota is a typical rural state. With 77,121 square miles, the state's villages, cities and towns are connected via 83,744 miles of highways, most of which are rural highways. At the same time, South Dakota only has a population of 754,844 or 9.9 persons per square mile. Given the enormous geographic size of the state, South Dakota drivers are more likely to travel a longer distance to fulfill their needs on roadways that have a speed limit of 55 mph or higher. As a result, 90% of traffic accident fatalities in South Dakota occurred in rural areas and the state fatality rate is 2.3, higher than the national average of 1.5, according to NTHSA 2008 report. Given the tightening safety improvement funds and competing resources, it is essential to identify the high risk locations that exhibit severe safety needs so that safety funds can be optimally allocated to achieve maximum return.

To identify safety problem areas on a continuous basis via a systematic approach, a sliding window algorithm is being developed. A sliding window is an analysis technique in which a "window" of a designated length, typically 1 mile, is incrementally advanced along the highway by a shorter distance, frequently 1/10 mile. As the window progresses along the length of the segment, analyses are conducted for each designated one-mile highway length. This allows are more precise identification of high crash locations along a highway. Meanwhile, safety performance functions (SPFs) are being developed using South Dakota crash data to estimate the expected number of crashes for each roadway segment.

The output of the prototype tool and the values calculated from the SPF's for a section of S.D. Highway 28 near Estelline are shown in the figure. The performance measures can be determined by the various outcomes of the observed crash frequency, expected crash frequencies or their derivations.



Optimizing pavement marking performance on South Dakota highways

MPC researchers at SDSU are looking into factors that may affect the performance and durability of pavement marking installed on South Dakota highways. The project is expected to evaluate the performance of different marking materials and application techniques under varying traffic, geographic, surface, and other conditions.

Retroreflectivity measurements from test sections of newly installed marking on Interstate I-90 near Chamberlin, SD, started in June 2009 and will continue through 2010. This will allow for the incorporation of the effects of winter maintenance after one winter in service. Other test sections from different geographic locations in South Dakota will be identified during the construction season of 2010.

At the conclusion of the study, a decision matrix for performance-based type selection of pavement marking will be developed. The study is co-funded by MPC, South Dakota Department of Transportation, and SDSU.

Graduate research assistant Tom Larsen (left) recording retroreflectivity readings from new pavement marking of a solid yellow line on asphalt.

PROJECTS COMPLETED

Several MPC projects were recently completed. Full reports on the efforts can be found by using the search function at http://www.mountain-plains.org/pubs/.

Researchers examine long-term cost of transportation damage from earthquakes

Earthquakes damage transportation infrastructure. In addition to replacement and repair costs for damage to transportation structures, large earthquakes can increase time delays resulting from a network component's loss of function. Damage to the network can severely disrupt traffic flows for several months or years.

With support from the Utah Department of Transportation, researchers estimated traffic disruption user delay costs resulting from two earthquake scenarios in Utah. The VISUM traffic macro-simulation model was used to estimate the delay-based user costs. Road segments, which are vulnerable yet critical to detour traffic following an earthquake, are prioritized for rehabilitation. The calculated user costs show

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(earthquakes continued)

that the Taylorsville Scenario would incur $65 million, which is significantly lower than the Wasatch Scenario of $1.312 billion. Links that are susceptible to damage in one scenario, but critical in carrying detour traffic for the other scenario, are defined as lifelines. A shortlist of lifelines is provided for each earthquake scenario with detailed information, including names, directions, and addresses.

This report presents the estimated delay-based user costs due to the traffic disruptions caused by two earthquake scenarios: (1) the Wasatch Scenario and (2) the Taylorsville Scenario. Road segments that come under fault zones are most likely to get damaged after an earthquake. These road segments are defined as vulnerable links. Links that can carry considerable detour traffic after an earthquake are defined as critical links. A list of links susceptible to damage, yet critical for each scenario, was prioritized for rehabilitation.

The objectives were to:

- Compile a list of links that would be:
  - Vulnerable to both the Wasatch Scenario and the Taylorsville Scenario (The most vulnerable links)
  - Critical to both the Wasatch Scenario and the Taylorsville Scenario (The most critical links)
  - Vulnerable in the Wasatch Scenario and critical in the Taylorsville Scenario (Lifelines for the Taylorsville Scenario)
  - Vulnerable in the Taylorsville Scenario and critical in the Wasatch Scenario (Lifelines for the Wasatch Scenario)
- Recommend UDOT potential protection, improvement, and maintenance procedures for lifelines.
- Determine how the earthquake damage influence traffic in terms of AM peak, mid day, PM peak, and off-peak traffic.
- Assess the impact of degree of damage on the traffic in terms of user delay costs.

More detail is provided in the final report, MPC Report No. 10-217, "Seismic Vulnerability and Emergency Response Analyses of UDOT Lifelines." The research was conducted by Aleksandar Stevanovic and Bhagavan Nadimpalli.

Testing self-consolidating concrete for structural applications in bridges

Recent studies have shown that the use of self-consolidating concrete results in improved finished quality, increased production efficiency, and reduced labor cost. The Federal Highway Administration and the precast concrete industry have been promoting the research and development of self-consolidating concrete for structural applications in bridges. Researchers at SDSU studied three full-scale prestressed bridge girders. One of the three girders was cast using conventional concrete and served as a control specimen, while the other two girders were cast using self-consolidating concrete. The self-consolidating concrete mix was made with quartzite coarse aggregate that is commonly used in eastern South Dakota. The results of the study show that the structural performance of the prestressed self-consolidating girders is similar to that of the control prestressed girder. It was also observed that the self-consolidating concrete girders have a better finished surface than the conventional concrete girder. MPC Report No. 08-196, "Structural Performance of Prestressed SCC Bridge Girders Made with Limestone Aggregates," was written by Nadim Wehbe, Arden Sigl, Zachary Gutzmer, and Chad Stripling.

Study examines alternative for predicting bridge scour

The SRICOS (Scour Rates In COhesive Soils) method had been proposed as an alternative design methodology for predicting scour at bridges founded in cohesive soils. As the new method can produce substantial savings in bridge construction costs at cohesive soil sites, it is important that the South Dakota Department of Transportation (SDDOT) evaluates the method carefully for use in bridge design. This research

project at SDSU compared the predictions of the SRICOS method for pier scour with measured scour at three bridge sites in South Dakota and examined the technical issues involved in using the method. MPC Report No. 08-195, "Evaluation of SRICOS Method on Cohesive Soils in South Dakota," was written by Francis C. K. Ting, Allen L. Jones, and Ryan J. Larsen.

WORKSHOP & PRESENTATIONS

UTCs collaborate in planning and funding freight conference and workshop

Faced with growing congestion and higher fuel prices, one of the great challenges of the United States is how to move goods safely and efficiently with the least impact on the environment. The challenges posed by freight transportation are markedly different from the challenges posed by urban commuting and intercity air travel. Freight shipments are typically generated from distant and global demands and move long distances in intercity corridors, passing through many communities en route. Many jurisdictions are affected by freight movements and many agencies and operators are typically involved. Freight shipments both contribute to and are affected by congestion.

Nine university transportation centers have collaborated in the planning and funding of the Transportation Research Board summer conference in Minneapolis, July 11-13, which addresses the U.S. DOT's Framework for a National Freight Policy. In addition to financially co-sponsoring the event, the university transportation centers have helped plan and organize a two-day track on multimodal freight and waterway transportation. The two-day workshop focuses on the performance and optimization of multimodal freight corridors. An objective is to improve interagency planning and integration of waterway, rail, and highway planning: with the end objective of increasing efficiency and reducing congestion in key freight corridors. In addition to the Mountain-Plains Consortium of North Dakota State University, the following university transportation centers are co-sponsoring the conference:

- The Center for Intermodal Freight Transportation Studies at the University of Memphis
- The Center for Transportation Studies at the University of Minnesota The Great Lakes Maritime Research Institute at the University of > Wisconsin-Superior
- The Mid-America Transportation Center at the University of Nebraska
- The Midwest Transportation Consortium at Iowa State University
- The National Center for Freight and Infrastructure Research and Education at the University of Wisconsin
- The Southeastern Transportation Center at the University of Tennessee
- The Southwest Region University Transportation Center at Texas A&M University

The conference will include 250 to 300 participants and attendees, including members of Congress, FHWA, FRA, MARAD, the U.S. Army Corps of Engineers, state transportation departments, ports, transportation operators, and many other stakeholders.

For more information, visit http://pressamp.trb.org/conferences/programs/default.asp?event=591

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(Workshops & Presentations continued)

Union Pacific Railroad engineer visits CSU for training on shear spiking

Colin Hepker, engineer associate for the Union Pacific Railroad – Southern Region Structures, visited CSU March 4-5 for training regarding the implementation of shear spiking to rejuvenate timber trestle railroad bridges.

The use of shear spiking is the topic ongoing research on Z-spiking supported by the MPC. While at CSU, Hepker attended a presentation and discussion on the past and current research project activity and the technology and mechanics of the process and benefits observed in laboratory studies. The session was conducted by Don Radford and Richard Gutkowski, the CSU faculty members who have led the research. Hepker was also instructed on the technique by graduate student Karthik Rudraprasad and was able to conduct spiking himself. Faculty member Jeno Balogh and Karthik then trained Hepker on the instrumentation and data acquisition equipment used to monitor the behavior of members load tested in the laboratory.

CSU graduate student Karthik Rudraprasad instructs Colin Hepker on shear spking techniques.

Hepker attended a team meeting held to develop preliminary planning of a field application and load test to be conducted in cooperation with the Union Pacific Railroad. In November 2009, a candidate bridge site was visited for initial assessment with Tomasz Gawronski of the Southern Region and his bridge inspection personnel. The bridge will serve as a future demonstration of the feasibility of field application of shear spiking by railroad personnel and assessment of pre- and post-spiking stiffness via a load test.

FACULTY ACTIVITIES

CSU's Chen named Outstanding Reviewer

Suren Chen

Suren Chen, assistant professor of civil and environmental engineering at Colorado State University, was named the American Society of Civil Engineering's 2009 Outstanding Reviewer for Journal of Bridge Engineering. Chen currently serves on four technical committees of ASCE.

John van de Lindt

van de Lindt surveys state DOTS on innovative steel bridge experience

John van de Lindt, associate professor of civil and environmental engineering at CSU, is preparing a survey for DOTs in the MPC member states which focuses on their experience with innovative steel bridges such as double composites, FRP cover plates, high-performance steel, post tensioning, and simple-made continuous design. The results will be made available to the MPC community as part of an ongoing CDOT project that is being leveraged with MPC funds, i.e. cost share both ways.

Gutkowski participates in ASCE Legislative Fly-in

CSU emeritus professor, far left, and others from Colorado visited with Sen. Michael Bennet, (third from left) during the ASCE Legislative Fly-in.

CSU emeritus professor, Richard Gutkowski was selected as a private citizen by the American Society of Civil Engineers to participate in its annual Legislative Fly-in held in Washington, DC, March 23-26.

The purpose of the event was to learn about issues in Congress that affect the profession of civil engineering and then present those issues to one's elected officials in the Congress. More than 200 ASCE members came from 48 states. Gutkowski and several others from Colorado visited with Sen. Michael Bennet (D-CO) and his staff, Rep. Betsy Markey (D-CO) and one of her staff members, and two staff members of the Sen. Mark Udall (D-CO). They discussed bills related to surface transportation, aviation, dam rehabilitation and repair, and water infrastructure. The fly-in participants shared ASCE viewpoints and positions on the bills.

Gutkowski was one of a limited number of participants also selected for partial travel support via ASCE Government Relations and was also provided funds from the ASCE Northern Colorado Branch. He also represented the Colorado Section of ASCE. Gutkowski was also recently awarded the honorary status of LIfetime Member of ASCE.

Qin Presents at TRB and TRF

Xiao Qin

Xiao Qin, assistant professor of civil and environmental engineering at SDSU, attended the 2010 Transportation Research Board TRB annual meeting in Washington, DC, in January and presented nine papers. The papers cover a wide range of issues in transportation planning, traffic operations, safety, and GIS. The paper titles were:

- "Traffic Demand Dynamics During Urban Freeway Short-Term Lane Closures"
- "Exploratory Shock Wave Approach for Signalized Intersection Performance Measurements Using Probe Trajectories"
- "Daily O-D Matrix Estimation Using Cellular Probe Data"
- "Negotiation-Based Conflict Exposure Methodology in Roundabout Crash Pattern Analysis"
- "Injury Severity of Multivehicle Crash in Rainy Weather"
- "Safety Decision Support System for Rural Highways"
- "High-Tension Median Cable In-Service Performance Evaluation and Cost-Effectiveness Analysis"
- "Proposed Safety Index Based on Risk-Taking Behavior of Drivers"

Qin also presented "Three-wheeler Crashes in Kandy, Sri Lanka and Implications for Road Safety" at the 51st Transportation Research Forum (TRF) annual meeting in Washington, DC, this March.

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(Faculty Activities continued)

In addition, Dr. Qin has three refereed journal articles published or accepted to be published in 2010, including "Identifying Crash-Prone Locations with Quantile Regression," accepted for publication in Accident Analysis and Prevention in July; "An Interactive Process of Micro-simulation and Logistic Regression for Short-term Work Zone Traffic Diversion" published in the ASCE's Journal of Transportation Engineering; and "Rainfall Effect of Single-vehicle Crash Severity Using Polychotomous Response Models" published in Accident Analysis and Prevention.

MPC researchers author papers presented at TRB

The Transportation Research Board annual meeting, held Jan. 10-14, covered all transportation modes. The more than 3,000 presentations in nearly 600 sessions addressed topics of interest to attendees which included policy makers, administrators, practitioners, researchers, and representatives of government, industry, and academic institutions. A number of papers authored by MPC faculty and students were presented at the meeting. They included:

- "Performance-Based Specifications for Highway Concrete from Pennsylvania to Utah" presented by Paul J. Tikalsky, University of Utah, during a workshop on performance-based specifications in current concrete practice.
- "Road User Impacts due to Speed Limit Reduction in Work Zones: Which Tool Is Best--QuickZone or VISUM?" written by Bhagavan Nadimpalli, Peter Martin, and Piyali Chaudhuri of the University of Utah and Aleksandar Stevanovic, formerly of the University of Utah and now of Florida Atlantic University.
- "Evaluation of Transit Signal Priority in Ring Barrier Controller and Advanced System Controller Series 3 Software-in-the-loop Simulation Environment" written by Martin, Stevanovic and Milan Zlatkovic who is also at the University of Utah.
- "Practical Perspective on Benefits of Combined Traffic Assignment and Control Method" written by Muhammad Farhan at the University of Utah and by Stevanovic and Martin.
- "Cross-Evaluation of Signal Timings Optimized by Various Traffic Simulation and Signal Optimization Tools" written by James Mulandi, James of H. W. Lochner, Inc. and Stevanovic and Martin.
- "High Wind Warning System to Prevent Overturning Truck Crashes in Wyoming" written by Qiyue Dai and Rhonda Kae Young of the University of Wyoming.
- "Need to Develop Core Concepts and Learning Outcomes for Introductory Transportation Engineering Course" written by Young and Steve Beyerlein of the University of Idaho, Andrea R. Bill of the University of Wisconsin-Madison, Ida Van Schalkwyk of Oregon State University, Kristen L. Sanford Bernhardt of Lafayette College, Shashi S. Nambisan of Iowa State University, and Rod E. Turochy of Auburn University.
- "Rural Variable Speed Limit System for Southeast Wyoming" written by Young, Jenna Buddemeyer and Brendan Dorsey-Spitz of the University of Wyoming.
- "Performance of Recycled Asphalt Pavement in Gravel Roads" written by Scott B. Koch of the University of Wyoming.
- "North Dakota Teen Driver Parent Survey" written by Kimberly Vachal of North Dakota State University.
- "Assessment of Demand for Rural Intercity Transportation Services in a Changing Environment" written by Jeremy Mattson, Del Peterson, David Ripplinger, William Thoms, and Jill Hough of North Dakota State University.
- "Classifying Rural and Small Urban Transit Agencies" written by Ripplinger.
- "Local Rural Road Safety Audit Guidelines

and Case Studies" written by Hesham Mahgoub, Ken Skorseth, Ronald Marshall, and Ali Selim of South Dakota State University.

NDSU expert comments on terrorism developments

Jarret Brachman

A Congressional committee, intelligence agencies, an international think tank, and national media outlets have tapped the expertise of an NDSU terrorism expert in the wake of the Fort Hood shootings, the Christmas Day airline bombing attempt and other terrorist attacks and plots.

Jarret Brachman, an associate research fellow who leads transportation security research at NDSU's Upper Great Plains Transportation Institute, has been interviewed numerous times for international, national, and local media and has been the featured speaker at several events focused on counterterrorism.

In November, in the aftermath of the Fort Hood shootings, Brachman made multiple appearances on CNN, National Public Radio, and the New York Times. He also was featured on a segment with ABC World News Tonight. In December, Brachman was invited to testify on topics related to the future of al-Qaida to the House Armed Services Committee's Subcommittee on Terrorism and Unconventional Threats.

The Christmas Day bombing attempt on Detroit-bound Northwest Flight 253 and the January suicide bombing in Afghanistan that killed American CIA officers, thrust Brachman back into the national spotlight. He made a number of media appearances in January, including an extended interview with the PBS NewsHour, National Public Radio, and multiple appearances on CNN. Brachman was cited in several New York Times articles and was quoted in Time Magazine and Newsweek. He also contributed to a feature story on detainees at the military detention facility in Guantanamo Bay with the Miami Herald.

In January, Brachman gave a talk at the Carnegie Endowment for International Peace titled, "Making the Next Bin Laden." Attended by more than 100 people from across domestic and foreign government agencies and members of the press, Brachman focused on the rising al-Qaida operatives who are positioning themselves to replace Osama bin Laden as head of the global al-Qaida movement. He also was a featured panelist for a conference at the Defense Intelligence Agency in January where he discussed al-Qaida's use of the Internet.

Brachman's research seeks to better understand how the nature of al-Qaida activism is evolving over time. "The evolution is being driven from the top-down, by the next generation of senior al-Qaida leaders. It is also being driven from the bottom-up, thanks to the grass-root examples being set by individuals like Humam al-Balawi, the Jordanian 'triple-agent' who perpetrated the January suicide bombing against the CIA base in Khost, Afghanistan," Brachman says.

STUDENT ACTIVITIES

Scott Koch

Koch named Student of the Year

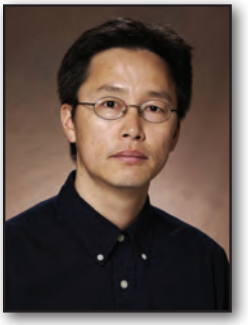
Scott Koch of the University of Wyoming was named the Mountain-Plains Consortium's University Transportation Center Student of the Year for 2009. Koch received the award at the 2010 Transportation Research Board Meeting in Washington, DC, in December.

Koch will receive his M.S. degree in civil engineering from the University of Wyoming in May. He earned his B.S. degree in civil engineering from UW in 2009. He was an undergraduate research assistant in the Department of Civil and Architectural Engineering in 2008 where he managed traffic counter equipment, performed traffic studies, surveyed road users, and assisted with graduate studies data collection. Since 2008, Koch has been a research assistant for the Wyoming Technology Transfer Center. His research focused on the use of recycled asphalt pavement in gravel roads as well as exploring the implementation processes associated with the Mechanistic-Empirical Pavement design Guide. His thesis is focused on the use of recycled asphalt pavement as a dust suppressant on gravel roads. He has performed surface distress surveys, and collected dust samples and moisture samples on eight test sections throughout Wyoming. He then used the data to conduct an analysis of the performance of the material in gravel roads. A paper on the work has been completed and submitted for publication.

Koch holds a 4.0 GPA for his graduate studies and was named to the College of Engineering and Applied Science dean's list every year during his studies at UW. He has received several scholarships including the Colorado-Wyoming Institute of Transportation Engineers Scholarship for 2009.

In addition to his research duties, Koch is a teaching assistant for soil mechanics, a junior level course at UW. He is currently the president of the UW Institute of Transportation Engineers student chapter, is a member of Tau Beta Pi (engineering honor society), and is a member of the UW Cowboy Football Program as well as the UW Rugby Program.

NDSU students honored



Eunsu Lee

Two NDSU transportation and logistics doctoral students were recently honored for their academic achievements.

Eunsu Lee's paper, "Estimating trip diversion by using impedance in flooding regions," was one of the winners in the GIS-T Student Paper Contest. The paper was presented April 12 at the GIS-T Symposium in Charleston, WV. Lee won a paid registration to the symposium and a cash award.

Lei Fan was awarded a $750 scholarship by the Transportation Research Forum Foundation. He was selected for the award based on his academic record and scholastic achievement.

Paper accepted for Research and Teaching Symposium

Khalid Backhar's paper, "A Decision Support System for Supplier Selection in a Chemical Firm Supply, Chain: A Case Study Leveraging Analytic Hierarchy Process Model," was selected to be presented at the 20th Annual North American Research and Teaching Symposium on Purchasing and Supply Chain Management in March. The annual symposium is presented by the Institute for Supply Management. Co-authors of the paper are Chris Enyinda and Denver Tolliver.

Graduating students

During the past year as well as this spring, the MPC program will see a number of students graduating.

"Graduation is a significant milestone for individual students," notes MPC director Denver Tolliver. "But the graduation of students is an accomplishment for the MPC program as well. It means we are doing our job of preparing the next generation of thinkers, innovators, and leaders in transportation."

Graduates include:

Jordan Jarrett earned her M.S. degree in structural engineering from CSU in August 2009. As a student, she worked on several MPC projects including those related to flexible highway barriers. Jarrett is continuing work related to structures and dynamics as a Ph.D. candidate in civil engineering at Virginia Tech.

Riley

C. J. Riley, a former employee at the Wyoming Department of Transportation and contributor to several MPC projects at CSU, defended his Ph.D. dissertation in September on the properties of fly ash. He was co-advised by CSU faculty members Rebecca Atadero and Paul Heyliger. Riley has taken a position in engineering at the Oregon Institute of Technology.

Namagga

Carolyne Namagga will graduate with an M.S. degree in structural engineering from CSU in May. As a student, Namagga worked on the MPC sustainable concretes for transportation infrastructure project.

Kergaye

Cameron Kergaye graduated from the University of Utah in 209 with a Ph.D. in civil engineering in 2009. He is a licensed professional engineer with the Utah Department of Transportation and has 20 years of experience working on some of the state's largest projects (such as I-15 design/build) as well as modest transportation studies (such as I-80 roundabouts near Park City). The focus of his dissertation was adaptive traffic signal control systems. Currently, he splits his time evenly between project management duties for UDOT and transportation research projects for the Utah Traffic Lab (utilizing a unique University of Utah/ UDOT partnering agreement).

Vladisavlejevic

Ivana Vladisavlejevic earned her Ph.D. from the University of Utah in 2009 in civil and environmental engineering. She investigated the impact of the cell phone conversation on traffic flow using microsimulation software VISSIM and won an award for her research in this area. Right now, she is concentrating on motherhood. Before coming to the Utah, she earned a B.S. degree at the Department of Transportation and Traffic Engineering at the University of Belgrade, Serbia and Montenegro.

Stevanovic

Jelka Stevanovic earned her Ph.D. in civil and environmental engineering at the University of Utah in 2010. She had previously earned her M.S. there in 2007. During her graduate years, she developed computer applications beneficial to various transportation studies. However, her main research area was development of tools, which

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(Student Activities continued)

improve traffic signal optimization practices. Her plans for the future include continuing applying both programming and transportation engineering knowledge to maximize traffic efficiency and safety. She holds a B.S. degree in mathematics and informatics, at the University of Novi Sad, Serbia.


Singh

Meera Singh earned her Ph.D. in transportation and logistics from NDSU in 2010. Her area of study has been highway congestion and safety as well as the study of transportation facilities and efficient uses from the cost perspective. The title of her dissertation was "A Statistical Model for Fatality Rates in Large Truck Crashes." Singh is planning a career in university teaching and research.


Bachkar

Khalid Bachkar earned his Ph.D. in transportation and logistics from NDSU in 2010. He will teach global logistics and supply chain management at the California State University Maritime Academy where he will also conduct research in the area of supply chain security. Bachkar's area of research interest at NDSU was in logistics and supply chain management, maritime transportation as well as supply chain security and supply chain risk management. His dissertation was titled, "Assessing the Security Risk in Global Container Supply Chains using Analytic Hierarchy Process Model."


Briggs

Charles Briggs earned his Ph.D. in transportation and logistics from NDSU in 2010. His primary area of study was supply chain management and his dissertation was titled, "Risk assessment in the Upstream Crude Oil Supply Chain: Leveraging Analytic Hierarchy Process." He is returning to Alabama A&M University where he will continue his teaching and research career in the School of Business.


Fan

Lei Fan earned his Ph.D. in transportation and logistics from NDSU in 2010. His primary interest was in supply chain logistics for freight shipments. Fan's dissertation was titled "Optimization Model and Risk Analysis for Global Supply Chain in Container Shipments: Imports to the United States." He will pursue a career in conducting analysis and planning in the merchandising and trading industry using quantitative methodologies.

New Student

Dilip Mistry is working on his Ph.D. in transportation and logistics at NDSU. His research focuses on optimization of supply chain management systems by integrating GIS with an enterprise resource planning system. Mistry earned an M.S. in computer science in 2003 from NDSU. He also holds a B.S. in naval architecture and marine engineering from the Bangladesh University of Engineering and Technology. He is a native of Gopalganj, Bangladesh.

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