

Catalyst



Accelerating the pace of transportation innovation

September 2018

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Research team recommends policy changes for Minneapolis ABC Ramps

Much has changed since the ABC Ramps in Minneapolis were completed in 1992: light-rail lines opened, mobility services sprouted, and technology innovations multiplied. Designed to ease congestion by encouraging carpooling and transit use, the ramps are now increasingly used by solo drivers and surrounded by congested streets. What directions should policymakers take in light of

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How does weather affect bike and pedestrian trail traffic?

To effectively plan and manage nonmotorized transportation infrastructure, decision makers need information about the factors that affect demand for bicycling and walking, including variations in weather and climate.

Planners and engineers frequently use monthly and seasonal adjustment factors to estimate annual average daily traffic (AADT) from data collected during short-duration traffic counts. However, bicycle and pedestrian traffic can fluctuate significantly in response to variations in

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CTS research conference looks at the future of driving



The annual CTS Transportation Research Conference will be held November 1 at the Graduate Minneapolis Hotel on the U of M east bank campus. The opening plenary and luncheon presentations are described below, and registration information is available at cts.umn.edu/events.

Opening Session: The Future of Driving in the Land of Freeways

Many states, including California and Minnesota, have identified reducing driving as an essential strategy to meet their targets for lowering greenhouse gas

emissions. How to achieve this strategy, however, remains a question. The rise of ride-hailing services, automated vehicles, and other innovations adds to this challenge. How can the research community help policymakers navigate this uncertain future?

Professor Susan Handy and her colleagues at the Institute of Transportation Studies at the University of California, Davis, are addressing these issues with a series of groundbreaking projects. She will discuss how emerging research results can help state, regional, and local agencies identify the most effective approaches, develop

implementation tools, and assess impacts on driving and other outcomes.

Handy is a professor in the Department of Environmental Science and Policy and director of the National Center for Sustainable Transportation at UC-Davis.

Following Handy's presentation, a panel of Minnesota leaders and experts will share perspectives on reducing greenhouse gas emissions in light of transportation innovations.

Luncheon: The Evolution and Potential of Automated Vehicle Technologies

Automated vehicles hold promise to reduce traffic congestion, pollution, crashes, and parking demand. But this promise can only be realized with advanced technology that ensures a vehicle's situational awareness through "perception" and mapping—in other words, letting it "see" its surroundings. Current systems, however, do not fully support automated vehicles on any road shared by driver-operated vehicles.

A major need is a high-performance sensor that uses laser light—LiDAR—to give "sight" to the automated vehicle. Julie Schoenfeld founded a company with unique technology to produce such a sensor. She will discuss this technology and share her journey as a serial entrepreneur to illustrate how technology entrepreneurship's pitfalls can be rerouted to successful peaks.

Schoenfeld is vice president of technical program management with GM Cruise Automation.



Center for Transportation Studies
200 Transportation and Safety Building
511 Washington Avenue S.E.
Minneapolis, MN 55455-0375

Phone: 612-626-1077
Fax: 612-625-6381
E-mail: cts@umn.edu
Web: cts.umn.edu

Publisher/Director: Laurie McGinnis
Catalyst Editors: Pamela Snopl,
Christine Anderson
Contributing Editors: Amy Friebe, Michael
McCarthy

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Study provides hard-rock and pile-stiffness data for bridge design



Rock samples were instrumented along the length and around the circumference of the cores.

For a bridge project in northern Minnesota, MnDOT designers needed data on “hard” rock that was too strong for the agency’s standard testing approach. To obtain the data, they turned to researchers in the Department of Civil, Environmental, and Geo- Engineering (CEGE), who used a high-capacity load frame at a campus lab to test rock samples from the project site.

The work was triggered by MnDOT’s recent rerouting of U.S. Highway 53

between the cities of Virginia and Eveleth, Minnesota, on the Iron Range to accommodate mining in the area. Designers planned a 204-foot-tall bridge, the state’s tallest, to be built on newly acquired land overlying hard iron ore rock.

Efficient bridge design uses site-specific rock stiffness and strength properties assessed by testing specimens in a load frame. “But few facilities are capable of testing hard rock for stiffness and strength, which is why properties are sometimes assumed or inferred from previous projects,” says Derrick Dasenbrock, geomechanics/LRFD engineer with the MnDOT Office of Materials and Road Research.

For this project, researchers led by CEGE professor Joe Labuz used a high-capacity load frame at the department’s rock mechanics laboratory to test both uniaxial compression (measuring deformation and stress that can be resisted by the rock) and triaxial compression (measuring stress while the sample is confined by pressure simulating the surrounding rock underground).

Suitable even for very hard rock, this system can apply loads of up to one million pounds, measuring the response and providing needed material parameters. “The rock testing project provided a wealth of data from over 150

compression tests,” Labuz says.

Dasenbrock adds that the rock testing data had overall program value. “It was exceptionally valuable for the U.S. 53 project, producing enough data to provide accurate material properties to our designers,” he says.

Concurrent with the rock testing work, researchers investigated the behavior of cast-in-place (CIP) concrete-filled steel pipe piles, particularly the effects of concrete curing and the influence of changes in concrete stiffness. “This work is unique in documenting the composite action of a CIP pile,” Labuz says.

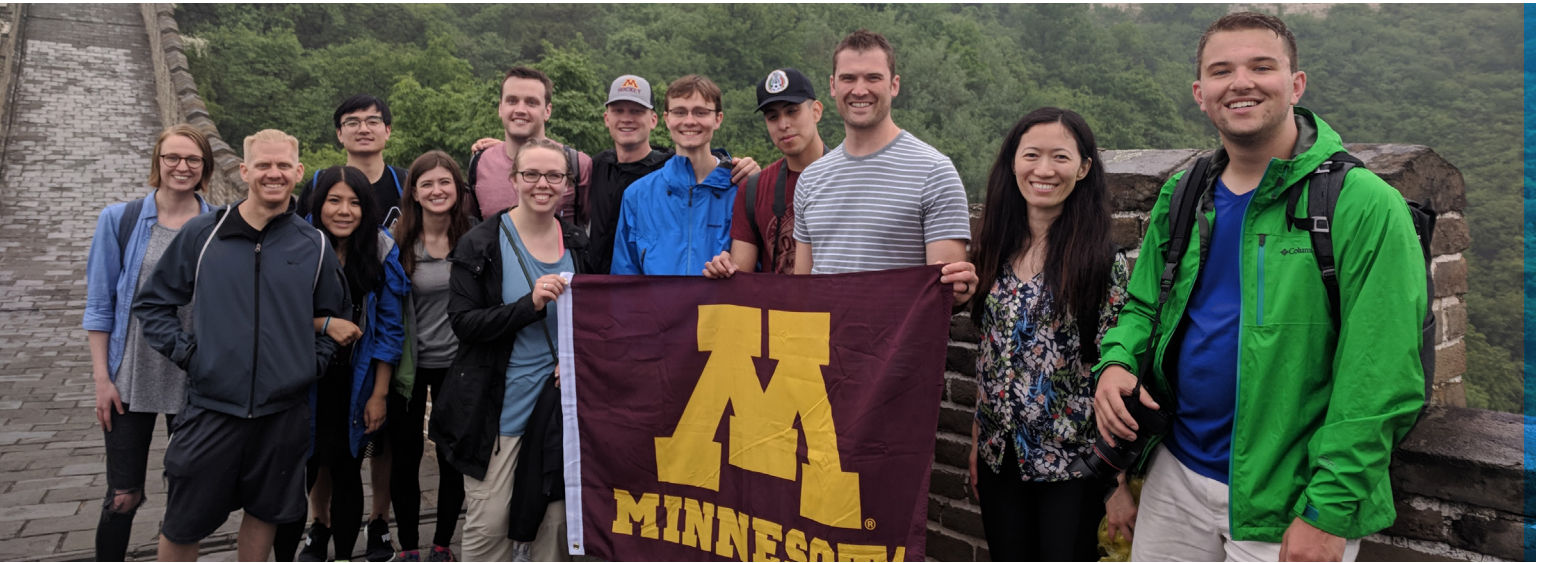
Investigators tested rock samples and a short pile segment in a high-capacity load frame to examine two distinct material behavior needs. The work resulted in:

- Stiffness and strength data from rock samples for the new bridge foundation design and for the Office of Materials and Road Research’s geological database.
- Stiffness characteristics of composite steel concrete-filled piles, and the influence of concrete curing, for use on CIP pile performance-monitoring projects.



A section of concrete-filled steel piling was placed in a high-capacity load frame.

Program promotes international student exchange



The Global Transit Innovations (GTI) program was again active this spring and summer with educational activities.

GTI coordinated a study-abroad course in spring semester that included visits to four cities in China. The three-credit, graduate-level course—Planning for China’s Urban Billion—was offered by the Humphrey School of Public Affairs.

The course covered a wide range of urban planning and international development topics, ranging from affordable housing provision to historic preservation to rural development to transportation demand management. It was led by GTI director Yingling Fan, a professor in the Humphrey School.

“If current urbanization trends continue, China will have an urban population of one billion by 2030,” Fan says. “How Chinese cities can minimize pressures and maximize opportunities of urban expansion is a critical question that affects every aspect of urban

planning.”

The two-week course familiarized students with urban planning practices and emerging development issues in four unique Chinese cities: Beijing, Xi’an, Guangzhou, and Hong Kong. “By integrating guest lectures, site visits, and cross-cultural classroom activities, the course created immersive learning experiences that connected students to foreign cultures, alternative ways of life, and exciting urban landscapes,” Fan says.

Of the 11 students, 4 were graduate students from the Humphrey School and the College of Design. Seven were undergrads from the Carlson School of Management, the civil engineering department, and the urban studies department.

Site visits included the first and largest dockless bikesharing company in the world and the China Academy of Urban Planning and Design. Lectures touched on topics such as transit-

oriented urban redevelopment, sustainable urbanism, and pedestrian comfort in dense cities.

Students from Chinese universities made the reverse trip this summer and spent four weeks in the U.S. as part of a GTI training program. Sixteen students from Southeast University, Nanjing Tech University, Nanjing Forestry University, Southwest Jiaotong University, and Chongqing Jiaotong University participated in the program. Courses included GIS, transportation planning, English speaking and writing, and cross-cultural communication. They also attended a variety of transportation-focused seminars both on and off campus.

This year is the first year that the GTI training program included field trips to several Midwest cities, including Chicago, Madison, and Milwaukee. “In Madison, we introduced them to UW-Madison, state governance, and the city’s biking culture,” Fan says. The program, first offered in 2016, was developed by CTS, GTI, and the U of M China Center’s Mingda Institute.

GTI is an affiliated program of CTS. Its education component aims to attract bright minds to the transit-planning field and educate practitioners and agency staff. Planning is under way for 2019 education activities.

Chinese students experienced Madison’s biking culture as part of their training.



weather, resulting in different monthly and seasonal patterns across the nation, within individual states and, potentially, within individual regions. Practitioners currently lack information about the extent of these variations and the extent to which these factors can be transferred and used across different areas.

To fill this gap, Greg Lindsey, a professor at the Humphrey School of Public Affairs, and Alireza Ermagun, a former Humphrey School master's student, participated in a research effort that explored how weather variations affect urban trail use by bicyclists and pedestrians in cities throughout the country. Lindsey and Ermagun partnered with a researcher from George Washington University on the project, which was conducted with funding from the members and supporters of the Rails-to-Trails Conservancy.

As part of the study, the researchers monitored multiuse trail traffic in 13 cities located in seven different climate zones across the United States. Multiuse trails are off-road facilities that serve bicyclists and pedestrians for utilitarian, recreational, and other purposes. In urban areas, these trails help minimize interactions with vehicle traffic and provide safe, comfortable places for travel.

Based on the monitoring data, researchers estimated average daily bicyclists (ADB) and average daily pedestrians (ADP) under varying weather conditions at different times of year. Using this data, the research team specifically explored the effects of variation in temperature, precipitation, wind speed, dew point, and snow depth on ADP and ADB. Significant study findings include:

- Bicyclists and pedestrians in the same climate region respond differently to variations in specific weather variables such as temperature and precipitation.
- Bicyclists and pedestrians in different climate regions both respond differently to variations in weather.
- Daily average temperature is the most important variable affecting



trail demand. Bicyclists are more sensitive to temperature than pedestrians in five of the seven climate regions. Bicyclists are also more sensitive to snow and average wind speed.

According to the researchers, these findings underscore the fact that demand and user patterns vary across the country and that these factors need to be considered when analyzing trail use. For example, the data show that seasonal use patterns in Duluth (in the “very cold” climate region) and Minneapolis (in the “cold” region) are very different, even though the cities are only about 135 miles apart. This demonstrates that seasonal factors should not be transferred across regions, the researchers say. Instead, practitioners should use models from their immediate geographic location or comparable climates.

Ultimately, the study's findings could help practitioners and funding agencies better plan systems and facilities, optimize investments, and increase efficiency of trail operations and maintenance. Potential uses for the information include helping to improve

the accuracy of tools used to estimate AADT and informing operational decisions about whether to maintain trails in winter or when to resurface facilities in summer.

The research team says future work could focus on more clearly defining the factors that contribute to the variations found in this study. For instance, it's likely that trail users in particular regions have adjusted to the local climate and common weather conditions. This factor, which could be explored by surveying bicyclists and pedestrians, could help account for differences in response to specific weather variables across regions.

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for links to research reports and other resources.

these changes? A U of M team analyzed the issues and made recommendations for the short and long term.

The ABC Ramps are the ending point for I-394, which connects Minneapolis to its western suburbs. The three large ramps are owned by the Minnesota Department of Transportation (MnDOT) and operated by the City of Minneapolis.

"I-394 and the ABC Ramps are notable among interstate projects for their use of high-occupancy vehicle lanes and parking facilities to achieve higher

MnDOT sponsored an 18-month project with components split among University researchers and several transportation consulting firms. Douma's team included Professor Yingling Fan, Associate Professor Jason Cao, and researcher Adeel Lari of the Humphrey School.

"We found that all corridors to the ABC Ramps are congested," Douma says. "But interestingly, in an online survey, more than 60 percent of ramp users said they were not using their preferred commute mode. And of the 54 percent

ABC Ramps better reduce downtown congestion," Douma says.

The team also recommends other pricing innovations, such as a discounted daily rate for occasional carpoolers and flexible contracts with both ramp access and transit options. "Let's unbundle the parking benefit and rebundle it into a transportation benefit," Douma says.

The biggest area of opportunity is to encourage businesses to provide more flexible incentives for employees, Austin says. Currently commuters who receive transportation benefits from their employers choose between a monthly parking contract or a monthly transit pass. "If the ABC Ramps can offer a flexible option that allows part-time parking and part-time transit benefits, it could reduce drive-alone rates and congestion and increase parking availability," she says.

Douma also advises expanding current services offered to cyclists, pedestrians, and transit riders while adding more drop-off and pick-up areas for ridesharing and more charging stations for electric vehicles. "In the long term, with automated vehicles and vehicle electrification on the way, the ABC Ramps will have to react nimbly to policy and technological shifts," he concludes. "One day, portions could even be converted to residential or commercial use."

A final report will be available this fall. "We are very excited about the findings in this study," Austin says. "It will help us provide commuters with the transportation choices they want and fulfill the ABC Ramps' purpose to reduce congestion by reducing drive-alone trips."



freeway-carrying capacity," says Frank Douma, director of the State and Local Policy Program at the Humphrey School of Public Affairs.

Since 2010, however, there has been a continual decline in monthly carpool contracts, from about 1,200 to 750. "Single-occupant vehicle contracts are becoming much more prevalent, and the ramps are often full," says Lisa Austin, MnDOT ABC Ramps coordinator.

To explore ways to reduce solo driving and plan the ramps' future,

who drive alone, only 12 percent said it was ideal. The majority said they wish they could take transit at least some of the time."

The ramps successfully attract traffic from the corridors they were designed to serve: I-394 to the west and I-94 to the north. Carpoolers from these specific areas—just over half of traffic to the ramps—receive a discounted monthly rate. "But offering the discounted carpool rate to carpools from across the entire Twin Cities region could help the

Study results presented at symposium

The ABC Ramps study was the focus of a symposium held August 6 on the Minneapolis campus. The event was hosted by the U of M, MnDOT, the City of Minneapolis, and SRF Consulting.

Frank Douma presented study results (see related article), and Paul Morris of SRF Consulting gave highlights from the draft implementation plan. Attendees also heard

from national and local experts who shared best practices and examples. Other symposium topics included the importance of equity and public engagement and the role of public-private partnerships for mobility hubs.

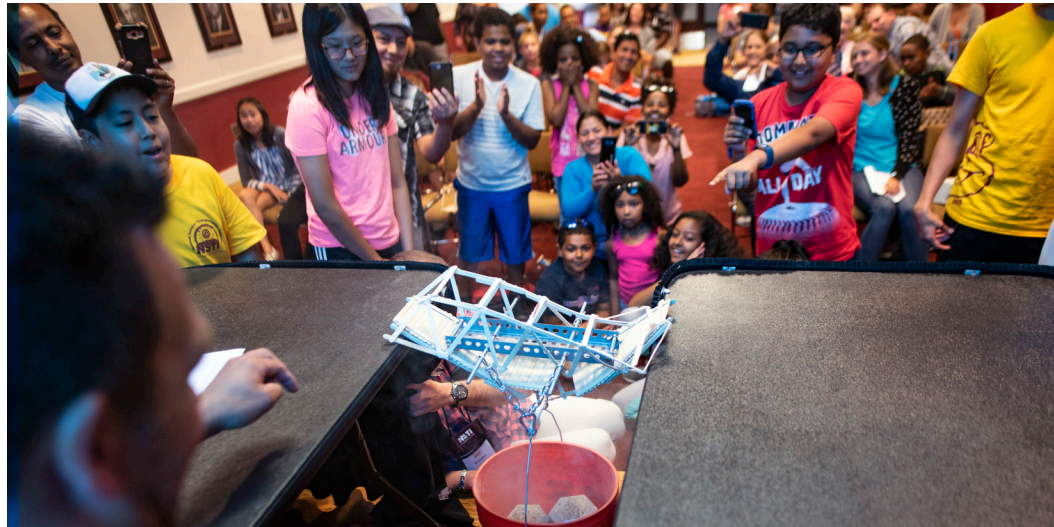
The implementation plan and symposium proceedings will be available this fall.

Students explore transportation topics, careers in summer programs

This summer, CTS participated in a variety of activities that introduced middle and high school students to transportation topics, careers, and education opportunities.

For the fourth consecutive year, CTS hosted and sponsored the National Summer Transportation Institute (NSTI). This free two-week program, open to students entering grades 7–9, is designed to attract a diverse range of students to education and career possibilities in transportation. This year, 25 campers engaged in classroom activities, went on field trips, and explored campus life at the U of M.

During visits to the Metropolitan Airports Commission, Mississippi Watershed Management Organization, Metro Transit, and Hennepin County Public Works, students got a firsthand look at transportation in action. Campers were also introduced to the wide range of transportation-related research conducted at the U of M on tours of the HumanFIRST Laboratory, Thomas E. Murphy Engine Research Laboratory, and Multi-Axial Subassembly Testing (MAST) Laboratory. In other sessions,



students learned about the future of transportation, urban planning, bridges, and more from transportation experts.

Student highlights included the camp's hands-on activities and the opportunity to meet and learn from working professionals on the field trips. "My son is truly energized to learn more about transportation and engineering," one parent said.

CTS also organized tours of transportation-related labs at the U of M for girls in the Eureka! Program in

July. The program, a partnership between the U's College of Science and Engineering and YWCA Minneapolis, helps girls explore STEM-related careers and prepare for next steps in their education. As part of the session, 25 ninth-grade girls visited the Minnesota Traffic Observatory and the Michael M. and Nancy L. Heuer Soil Mechanics Laboratory.

In August, CTS arranged an afternoon focused on bicycle and pedestrian safety for Discover STEM, a week-long summer camp offered by the U of M's College of Science and Engineering. About 25 students in grades 11 and 12 participated in the session, which began with a demonstration of a bicycle collision-avoidance system being developed by mechanical engineering professor Rajesh Rajamani. Then, Humphrey School professor Greg Lindsey led the students in a discussion focused on bike and pedestrian safety and how science is used in urban planning.



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Center for Transportation Studies
University of Minnesota
200 Transportation & Safety Building
511 Washington Ave S.E.
Minneapolis, MN 55455

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