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THE CIVIL SCOOP

University of Minnesota Duluth
Department of Civil Engineering

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ASCE Concrete Canoe

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L-R: Nick Osmundson, April Boehne, Aly Berreth, and Jack Patton paddling in the 2016 races.

This April, the University of Minnesota Duluth ASCE Student Chapter competed in the 2015-2016 concrete canoe competition in Ames, Iowa hosted by Iowa State University. The team participated in a formal dinner the night before the races to network with other students from competing colleges, including University of Minnesota Twin Cities, Mankato State University, North Dakota State University, South Dakota State University, Dordt College, University of Wisconsin Platteville, University of Iowa, and Iowa State University. The next morning the team headed to Iowa State University to give a presentation on the canoe making process throughout the year. After that, the team headed out to Don Williams Lake to compete in five races with the other teams. UMD placed fourth in the races among the nine teams present.

OUR MISSION

The mission of the Department of Civil Engineering at the University of Minnesota Duluth is to prepare graduates for professional practice and graduate study through a program firmly based in strong technical skills, fundamentals, hands-on learning, sustainability, and professionalism.

A Message from the Department Head

The end of the 2015-2016 academic year is upon us. It has been a year to grow through for UMD Civil Engineering. We were visited by ABET in September 2015 and are on track to get a six year accreditation without any weaknesses. This past weekend, we dedicated a memorial to a student who sadly passed away last spring break on March 23, 2015. Losing one of our students is difficult. We took the opportunity to stop and remember how important our students are to us, and to consider the trust represented by each student who is in our program. We dedicated a memorial to Chase Hunter DeDominces, but in a sense it is a reminder to us regarding each student we touch.

Student activities have been at a higher level than in any recent year. Two of our students received ACEC scholarships. Our student teams entered numerous competitions, including: National ASCE GeoWall, hosted the Regional GeoWall, Concrete Canoe, and ACI team competition. The competitions are valuable in building relationships with professional organizations, other schools, and in introducing the students to life long learning. The department once again participated in hosting the ASCE Toothpick Bridge competition. There were over 120 competition bridges.

We hosted our 5th Annual CE Job Fair in February 2016. There were 24 employers here to talk to our students. It was also fun because we had a few guests come and visit. Two students came down from the Iron Range Engineering program to talk to employers. We hope they will be back next year, since it added a nice dimension to the event. In the fall semester we also had three engineering graduates participate in the Order of the Engineer Ceremony.

We have re-introduced a departmental seminar to increase the students' awareness of educational opportunities outside of the classroom. Dr. Carlos Carranza-Torres has been contacting many of you and asking if you would be willing to come and talk about a recent project with our students. We appreciate all of you who have participated in our seminar series. We intend to continue this seminar series in the coming year also.

In the previous issue of the Scoop, we said farewell to two of our faculty. In this issue we come full cycle and introduce the faculty we have added. These include three Civil Engineering Faculty: an environmental faculty, a transportation/materials faculty, and a structures faculty. The first two new arrivals will be introduced in this issue, while the new structures faculty will be introduced in the next issue of the Civil Scoop, hopefully with an additional structures faculty member, who is being searched for in the next year. We are excited not only about our new faculty, and the talent they are bringing to our community here at University of Minnesota Duluth.

In addition to these new hires, we have an old friend returning. Dr. Andrea Schokker, is returning to the department from her position as EVCAA, which is the number two position at UMD. She came back to us looking forward to closer interactions with the students and with the faculty in Civil Engineering. In the process of sorting out what that would mean to all involved, we have asked her to return to the department in the position she left. So, this will be the last letter I write as Department Head. Dr. Schokker, will be resuming her former responsibilities as Department Head of Civil Engineering in Fall 2016, and I will be Professor of Civil Engineering with a specialization in environmental. Andrea, welcome home.

Adrian T. Hanson, Ph.D., PE, BCEE
Department Head and Professor
Department of Civil Engineering

STUDENT ACHIEVEMENTS

SCSE Student Scholarships



Front row (L-R): Nicholas Osmundson, Alexander Thelemann, Corey Schlosser, Laura Hart, April Boehne, Brittany Fossell, Bryce Hansen, Alex Tappe, Samantha Bowman
Back row (L-R): Colin Ose, Jared Nash, Brandon Clark, Gregg Matlock, Zachary Whitley, Katherine Steen, Milleana Klemetsen, Anna Jefferson, Ashley Murr, Joseph Thiry

Nineteen Civil Engineering students received scholarships at the 27th annual University of Minnesota Duluth Engineering/Industry Banquet on October 19th, 2015. The Department of Civil Engineering extends sincere thanks to the following alumni, faculty, friends, and organizations who supported our students and programs with a charitable gift. Listed below are the names of those who received these scholarships as well as which scholarship they received. Congratulations to our students and thank you to our donors for your generous contributions!

Scholarship	Recipient
Jill & Terry Swor	Milleana Klemetsen, Gregg Matlock, Katherine Steen & Zachary Whitley
Barr Engineering	April Boehne & Laura Hart
SCSE Roy LaBounty	Nicholas Osmundson
Cliffs Natural Resources	Brandon Clark
Krech Ojard & Associates	Brittany Fossell
LHB Incorporated	Ashley Murr
Minnesota Power Foundation	Corey Schlosser
TGF Memorial	Alexandar Tappe
Ulland Brothers Incorporated	Alexander Thelemann
Civil Engineering	Bryce Hansen
Engineering Industry and Alumni	Anna Jefferson
J.R. Jensen	Jared Nash
Lake Superior Consulting LLC	Colin Ose
Mary Ann and Jerry Ostroski	Samantha Bowman
TKDA Scholarship	Joseph Thiry

CEAM Scholarship



Brittany Fossell



April Boehne

Two students, April Boehne and Brittany Fossell, were awarded the City Engineers Association of Minnesota scholarship. Each year, the CEAM Scholarship Committee awards six students—two from the University of Minnesota, two from Minnesota State University Mankato, and two from University of Minnesota Duluth—\$2,500 scholarships to pursue their studies in the field of engineering. The committee also selects two students from Minnesota technical colleges to receive \$1,000 scholarships for their studies in the field of engineering technician.

ACEC Student Scholarships



Laura Hart (fourth from the left) and Matthew McDermott (center) at the ACEC awards banquet.

Two students, Laura Hart and Matthew McDermott, were awarded scholarships from the American Council of Engineering Companies (ACEC) for the 2016-2017 academic school year. These awards were presented at the 49th annual ACEC/MN Engineering Excellence Awards Banquet, which drew over 250 attendees to the Radisson Blu Hotel in Minneapolis on January 29, 2016. The Engineering Excellence Awards committee recognizes engineering achievements that exhibit the highest degree of merit and ingenuity. The group's award committee seeks students who demonstrate great leadership within their schools and community as well as valuable work experience, high academic achievement, and an understanding of the consulting engineering profession.

DEPARTMENT NEWS

New Faculty



Dr. Manik Barman

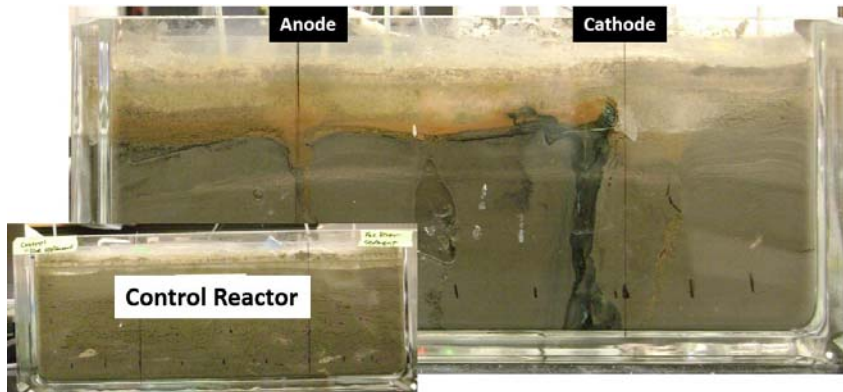
Dr. Barman joined the Civil Engineering Department in fall 2015. Prior to that, he served as a Senior Research Fellow at the University of Oklahoma (OU) after completing his Ph. D. research at the University of Pittsburgh. Before coming to the USA in 2008, he worked as a Lecturer and an Assistant Professor in two different Indian Universities. Dr. Barman teaches infrastructure materials and pavement engineering related courses and conducts research in pavement areas. He is currently expanding the existing pavement engineering laboratory to include research activities in both cement and asphalt concrete materials. One accelerated load testing facility (Beam ALF) is being developed for performance evaluation of pavement materials under simulated vehicular loads. Dr. Barman is the Principal investigator of two sponsored projects at UMD: (i) Thermal cracking resistance of fiber reinforced asphalt mixtures (funded by St. Louis County), and (ii) Development of a specification for using fiber reinforced concrete in thin concrete overlays (funded by MnDOT). He is also a Co-PI of three ongoing research projects housed at OU. He is actively involved in several professional organizations (e.g., ASCE, TRB, ACI, ACPA, ISCP, NRR, etc.) and currently serves as a Young Member in the two Standing Committees of the Transportation Research Board. He is a regular reviewer of the research papers for several journals, namely, Transportation Research Record, International Journal of Pavement Engineering, International Journal of Pavement Research and Technology, Construction and Building Materials, Innovative Infrastructure Solutions, and International Society of Concrete Pavement (ISCP).



Dr. Chan Lan Chun

Dr. Chan Lan Chun obtained her Ph.D. in 2006, at the Department of Civil Engineering (Environmental Engineering Program), University of Minnesota, Twin Cities Campus. In her PhD research, Chan Lan studied the fate of disinfection by-products in drinking water distribution systems. From 2008 until 2011, Chan Lan became a postdoctoral scholar at the Medical University of South Carolina, where she worked in the development of an innovative in situ bioremediation technology to clean up organic contaminants in aquatic sediments. Thereafter, from 2011 until 2015, she came back to the University of Minnesota, Twin Cities Campus, and worked as a Research Assistant Professor at the Biotechnology Institute. Since Fall 2015, Chan Lan is an Assistant Professor at University of Minnesota Duluth, based in the Department of Civil Engineering and the Natural Resources Research Institute (NRRI). Chan Lan's current research focuses on the characterization of chemical and microbiological contaminants in environment and development of remediation technologies. She is a faculty member of the Water Resources Science Graduate Program and Minnesota Aquatic Invasive Species Center. Chan Lan has been active in professional communities by participating professional organizations (e.g ACS, ASM, AEEESP, AWWA, etc.) and serving a peer-reviewer for scholarly journals.

New Faculty Research



Preliminary result of stimulation of sulfate reduction and iron sulfide precipitation (black band near cathode) in batch sediment electrochemical cell with the applied voltage of 2.0 V and iron electrodes vs. control (no applied voltage).

enhance microbial sulfate reduction and sulfur recovery from high sulfate waste streams. Additionally, they hope to discover how the microbial community responsible for the biological transformations (sulfate reduction, elemental sulfur production) responds to electrochemically-stimulated production of reductants and oxidants by culture-independent methods.

Dr. Chan Lan Chun was recently awarded the Water Resource Center Annual Grant Competition award for her project on Enhanced Microbial Sulfate Removal and Recovery through a Novel Electrode-Integrated Bioreactor. This project entailed seeking cost-effective strategies to combat elevated levels of sulfate in Minnesota surface waters. PI Dr. Chun will employ continuous electron donor substrates to sustain biological sulfate reduction. Chun and co-PI Daniel Jones hope to determine the efficacy of electrolysis of water and/or iron to

5th Annual Career Fair

The UMD Department of Civil Engineering hosted the 5th annual Civil Engineering Career Fair on Friday, February 5th, 2016 from 9:30am - 12:30 pm in the High Bay Lab. Again this year, UMD Career and Internship Services formed a partnership with the Civil Department in order to assist with another successful career fair. Approximately one hundred students and twenty four companies participated. Companies that attended include; AET, AMI Consulting Engineers, Braun Intertec, City of Duluth, Enbridge Energy, HGA, Karvakko Engineering, KLJ, Krech Ojard & Associates, Larson Engineering Inc., LHB Inc., McNair Scholar Program, Meyer Borgman Johnson, MnDOT, MSA Professional Services, Northland Consulting, Northwoods Paving, Permasteelisa, Short Elliott Hendrickson Inc., SRF Consulting Group, St. Louis County, United States Air Force, VAA, WisDOT. The UMD Civil Engineering Department would like to extend another big thank you to the companies that attended.



Grant Magnuson (left) speaking to Brett Weybright from MnDOT at the 2016 career fair.

STUDENT ORG. NEWS

ACI



Back row L-R: Miranda Anderson, Bryce Hansen, Scot Larson, Adam Giannini, William Pelton, Aaron Brockman
Front row L-R: Luke Connor, Dr. Mary Christiansen, Jacob Bray, Sean Brown, and Anthony Johnson

During fall semester, the American Concrete Institute (ACI) student chapter at UMD traveled to Denver, Colorado for the semi-annual ACI Convention. During the convention UMD ACI students visited various presentations from engineers all around the world and attended ACI committee meetings. The convention also allowed students to network with companies and other civil engineering students around the country. During the convention, ACI Duluth student chapter participated in the pervious concrete student competition. The focus of the competition was to make cylinders of pervious concrete that were tested in tension and various other attributes. Two separate teams competed, each team was sent with two different cylinders. While in Denver the students were able to spend some time visiting

the city. ACI traveled to Milwaukee, Wisconsin this April for the spring convention and sent two teams again for the FRF bowling ball competition. This competition focused on compressive strength, reinforcement, presentation, and performance of the casted ball. As the only Minnesota collegiate ACI chapter attending the convention, the students are proud to represent the state and UMD.

GeoWall

In February, five students competed in the national GeoWall competition. The goal of the competition was to build a mechanically stabilized earth (MSE) wall using as little reinforcement as possible. The MSE wall was constructed from 60 pound construction paper. The MSE wall was loaded with 30 pounds of sand applied eccentrically to the wall face. The load frame had to withstand a 60 pound load and be made with only wooden components and be assembled during the competition. In just their second year of competing, the team placed 5th nationally and beat many universities which have competed annually since the competition began. The team will be lead by Garret Larson in the 2017 competition and their sites are set on placing in the top three. Along with competing, the GeoWall team participated in the conference and learned about many topics including soil aging, sustainability, geotechnical education, and earthquake engineering. UMD students planned and hosted the first Midwest Regional GeoWall Competition on April 1st. The Midwest Regional Competition will become an annual event with MSU-Mankato hosting in 2017.



L-R: Ian Bradshaw, Miranda Anderson, Bryce Hansen, Kyle Fritz, and Garret Larson

ASCE



ASCE members casting the concrete canoe

This year the ASCE completed their fourth concrete canoe for the annual Concrete Canoe competition. Teams are judged on their design paper, presentation, races, and final product/aesthetics. Included in the scoring are the team's design process, mix testing, project management, and improvement from the previous year. The competition provides students with the opportunity to create concrete mixes and implement the design process outside the classroom setting, while including some friendly competition. This year ASCE picked two specific areas to improve upon, which were the canoe shape and the mix. Their reasoning for choosing these areas to focus on was to have a more aesthetically pleasing canoe. After designing and testing, the students cast the canoe on February 6th. By mid-March the canoe was finished and final fixes were completed in

early April. ASCE was sponsored by and received donations from Swenson College of Science and Engineering, the Civil Engineering Department, Arrowhead Concrete Works Inc., Brock White Construction Materials, 3M, Dow Chemical Company, AVR Inc., Lanxess, Henrich & Sons Ready-Mix Concrete Inc. Other smaller monetary donations were distributed between ASCE, concrete canoe team and Geowall team.

SWE

The UMD Society of Women Engineers is having a successful year filled with professional development events and mentorship. This February, sixteen women and four men traveled to UW Platteville for the 2016 Society of Women Engineers Region H Conference. They attended several sessions including some on lean manufacturing tools, graduate school, new engineering technologies, and emotional intelligence. In addition, SWE hosted over fifty middle-school students on Saturday March 19th in the UMD Civil Engineering High Bay for "Spring Into Engineering". Students had the opportunity to learn



Students test the catapults they designed and built.

about all fields of engineering through activities like catapult construction, earthquake-proof building design, and soldering with solar panels. One of the goals was to foster team work through a design/re-build process while also showing the creative elements of engineering. The event was offered at no cost to participants thanks to a UMD Public Engagement Grant and sponsorship from Enbridge Energy.

RESEARCH & SEMINARS

Graduate Seminars

In the Fall of 2015, the Civil Engineering Department began hosting a series of graduate seminars which are opened to graduate and undergraduate students. These seminars take place (approximately) every two weeks throughout the semester, on Fridays from 1:00 PM to 2:00 PM in the high bay area of the Swenson Civil Engineering Building. Speakers for the seminars are university faculty, professional engineers, and graduate students. The seminars, which include a 40 minute presentation and 10 minute slot for questions, allow students to learn about civil engineering applied research and practical projects on a variety of topics relevant to civil engineering. The seminars are also a social gathering opportunity for students to connect with speakers, with faculty, and with students themselves in an informal and friendly atmosphere, which includes pizza and soda for all attendees. Below is a list of seminars offered during the last two semesters.

Fall 2015:

- *“Intelligent Compaction of Pavement Subgrade and Asphalt Layers”*, by Dr. Manik Barman, Assistant Professor, Department of Civil Engineering, UMD (Oct 9, 2015).
- *“Structural Design Considerations for Maurices Headquarters' Project: the Largest Downtown Commercial Development in Duluth's History”*, by Paul Johnson, PE., Associate at Meyer Borgman Johnson, Duluth Office (Oct 23, 2015).
- *“Microbial Electoremediation of Persistent Contaminants in Sediment”*, by Dr. Chan Lan Chun, Assistant Professor, Department of Civil Engineering, UMD (Nov 6, 2015).
- *“From Understanding Rock Cutting to Optimizing Drilling Operations”*, by Dr. Emmanuel Detournay, Theodore W. Bennett Chair in Mining Engineering and Rock Mechanics Professor, Department of Civil, Environmental, and Geo-Engineering, U of M, Twin Cities (Nov 20, 2015).
- *“Ins and Outs of Pervious Concrete”*, by Dr. Mary Vancura, Senior Engineer, Beton Consulting Engineers, Twin Cities (Dec 4, 2015).

Spring 2016:

- *“Association of Clostridium botulinum with the Macroalga Cladophora in the Great Lakes”*, by Dr. Chan Lan Chun, Assistant Professor, Department of Civil Engineering, UMD (Feb 12, 2016).
- *“Integrating Virtual Reality into the Design Process”*, by David M. Sheedy, PE, SE, LEED AP, CCS, CCCA and Daniel J. Stine, CSI, CDT, LHB Corporation, Duluth Office (Feb 19, 2016).
- *“Revitalization of the Northrop Memorial Auditorium: A Case Study of Structural Reconstruction From the Inside Out”*, by J.W. Murphy Curran, P.E., Associate at MBJ, Minneapolis Office (Mar 18, 2016).
- *“The Great Flood of 2012 & the Restoration of Thomson Hydro... for Another Century”*, by Christopher Rousseau, P.E., M. ASCE, Manager of Hydro Operations at Minnesota Power (Mar 25, 2016).
- *“Yielding, Failure, and Softening Response of Rock”*, by Dr. Joseph F. Labuz, MSES/Miles Kersten Professor and Department Head, Department of Civil, Environmental, and Geo-Engineering, U of M, Twin Cities (Apr 8, 2016).
- *“Using Miniature Specimens to Determine Properties of Asphalt Mixtures at Low Temperature”*, by Dr. Mihai O. Maras-teanu, Professor, Department of Civil, Environmental, and Geo-Engineering, U of M, Twin Cities (Apr 22, 2016).
- *“Improving Bond Behavior of Corroded Reinforced Concrete Beams with FRCM Repair”*, by Miranda Anderson, MSc Student, Department of Civil Engineering, UMD (Apr 29, 2016).
- *“Efficient Slope Stabilization and Repair of Minnesota Roadways”*, by Mitch Nelson, MSc Student, Department of Civil Engineering, UMD (Apr 29, 2016).
- *“The Effect of Compositional Variability in Waste Glass on Geopolymer Concrete Performance”*, by Scot Larson, MSc Student, Department of Civil Engineering, UMD (Apr 29, 2016).

Graduate Research

“Improving Bond Behavior of Corroded Reinforced Concrete Beams with FRCM Repair”

by Miranda Anderson



Deterioration of an RC beam due to corrosion

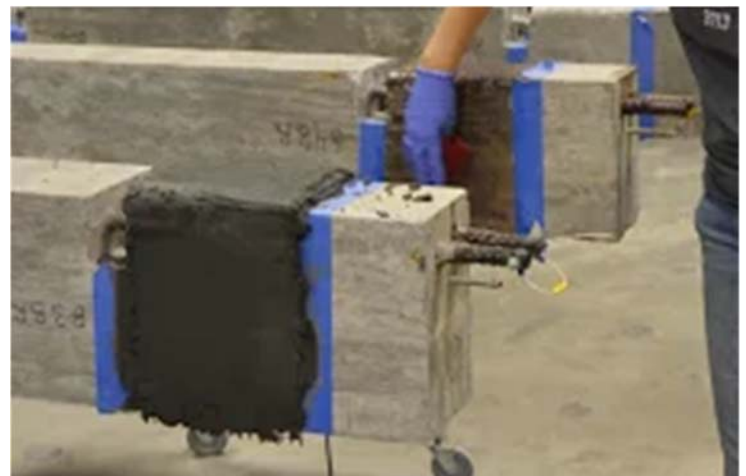
Background:

The winters in Minnesota require the use of deicing salts and plowing to keep the roads clear. Deicing salts work great on removing ice and snow from the roads, but they also initiate corrosion that leads to the deterioration of our reinforced concrete bridges (pictured left). Replacing deteriorating bridges is expensive; therefore, finding a way to effectively repair the damage caused by corrosion is desired. Fiber Reinforced Polymer (FRP), which involves attaching reinforcing fibers to the concrete surface with the use of an epoxy resin, has been the repair method of choice. Research has found that FRP has some limitations due to the epoxy resin including low heat tolerance, poor compatibility with the concrete surface. Fiber Reinforced Ce-

mentitious Matrix (FRCM) is an emerging method of repair in which the fibers are applied to the concrete surface with the use of a cementitious mortar. The cementitious mortar has a higher heat resistance and great compatibility with the concrete surface, so it resolves the issues found with FRP repair. It is essential that the bond between the reinforcement and the concrete be sufficient in order to transfer the load from the concrete to the steel effectively. One of the major contributors to bond strength is confinement, which can be either passive or active. Concrete cover and internal stirrups offer passive confinement, while external pressure offers active confinement. The confinement effect of FRP on bond behavior has been researched extensively; however, the confinement effect of FRCM on bond behavior has not yet been studied in the same manner. In order to understand the uses for each method, it is important to be able to compare the efficiency of both repair methods under similar conditions.

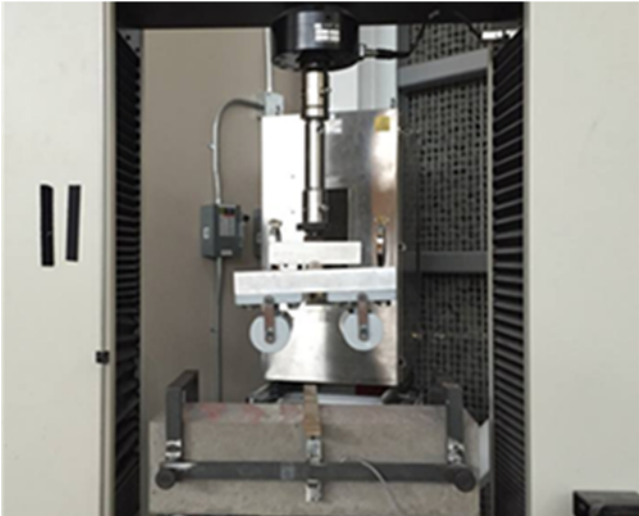
Research Update:

The present study is investigating the effect of corrosion and fiber reinforced cementitious matrix (FRCM) confinement on the bond behavior of reinforced concrete beams under monotonic and repeated loading. Thirty reinforced concrete beams with a cross section of 6” by 10” and a length of 6’6” were constructed for analysis in this study. Twenty-four beams were exposed to an accelerated corrosion process to induce a specified mass loss (either 5% or 15%). The beams have all been constructed, corroded to the desired level, and repaired. Testing started in April 2016.



Repairing corroded RC beam with U-shaped FRCM. The beam is upside down in picture.

Pavement Research Update



Setup for flexural performance of concrete

The pavement engineering laboratory has infrastructures to conduct research both in flexible and rigid pavements. An accelerated load testing facility (Beam ALF) is being developed for investigating the load transfer issues of concrete- and composite- pavements. Beam samples can be used to test the load transfer behavior of concrete.

Thermal Cracking Resistance of Fiber Reinforced Asphalt: Minnesota's asphalt pavements typically fail due to low temperature cracking (thermal cracking). The pavement research group is currently conducting a study to investigate whether application of acrylic and aramid fibers in the asphalt mixes can minimize the thermal cracking. This project is funded by the St. Louis County of Minnesota and will be completed in summer 2016.

Development of a Specification for Using Structural Fibers in Thin Concrete Overlays:

In another 2-year long project, starting July 2016, funded by the Minnesota Department of Transportation, the pavement research group will investigate the contribution of structural fibers in thin bonded concrete overlays. The findings from this study will be used for developing a specification for the selection and application of structural fibers in thin concrete overlays.

Research Group

The present research group comprises of Manik Barman (Assistant Professor), Jay Dailey (Research Engineer) and Bryce Hanson (under-graduate student). Starting Fall 2016, Bryce Hanson and Md. Towhid Ur Rahman will join as graduate students. Two under-graduate students, Jacob Pilz and Sam Butler, will also join the pavement research group in Fall 2016.

Environmental Impact of Cement

Over the summer, Dr. Mary Christiansen and UMD students began work on UMD's Sustainable Sidewalk program, which tested mixtures that included increased dosages of supplementary cementitious materials compared to the normal UMD sidewalk mix. UMD installed three of these experimental mixtures near the Swenson Civil Engineering Building at UMD. This project aligns with Christiansen's research in sustainable concrete design. Currently, Christiansen cites that about 5 to 8 percent of anthropogenic CO₂ emissions comes from the production of cement. The Sustainable Sidewalk Projects are aimed at eliminating portland cement from concrete mixtures in favor of an environmentally sustainable mix which reduces CO₂ emissions. As Christiansen said, "We're starting out slow with a 25% reduction of portland cement but we hope to eventually install some concrete that doesn't have any portland in it at all." Christiansen and her students will be installing another set of sidewalks on campus this summer outside of Voss-Kovach Hall.



Dr. Mary Christiansen (left) and Ryan Dagger (right) casting three experimental sidewalk mixes.

Transportation Projects



MnDOT crew during a snow event.

In the transportation engineering program, research is being conducted both in traffic systems and pavement engineering. Dr. Kwon and his research group conduct research in traffic operation/safety system design. Dr. Manik Barman conducts research in pavement materials and design. The following section provides a brief summary of the ongoing research activities in the Transportation engineering program.

Automatic estimation of normal condition regain time during snow events:

Being able to accurately and reliably estimate traffic conditions during snow events is critically important to transportation agencies for developing effective snow management strategies. The transportation research group, funded by MnDOT and led by Dr.

Kwon, has developed a traffic data-based, automatic process to determine the 'normal condition regain time' for given freeway corridors during snow events. The new process determines the time-variant road conditions by comparing the traffic data during snow events with the location-specific traffic-flow relationships, which reflect the driver behavior under normal weather conditions for both day and nighttime periods. The results from this research have been presented at the national conference and will be presented at the international symposium in Germany in June 2016. Currently Dr. Kwon's group is developing an operational system for MnDOT.

Estimation of traffic diversion at work zones:

The capability to accurately estimate the traffic diversion induced by work-zone delays and the capacity reduction associated with lane closures is of critical importance in developing effective traffic-management plans for a given construction site. This study, funded by MnDOT and led by Dr. Kwon, has developed an iterative estimation process to determine the traffic diversion rates for a freeway work zone by incorporating a freeway simulation model with the new diversion models developed by Dr. Kwon's group, which collected the field data from the work zones in the Twin Cities' freeways. The resulting process is currently being applied at MnDOT metro district.

Development of travel time reliability estimation system:

This research, funded by MnDOT and being led by Dr. Kwon, is currently developing a comprehensive system that can automatically estimate the travel-time reliability measures for given freeway corridors in the Twin Cities metro freeway network. The results from this research will be used by MnDOT to identify and prioritize the problem areas for both short and long-term improvements.

Current Research Group in Traffic Systems Engineering:

Eil Kwon, Ph.D., PE, PTOE, Professor

Chongmyung Park, Ph.D., Senior Scientist

Rudraskhi Biswas, Graduate Research Assistant

Industrial Advising Board

We have a group of individuals who contribute a great deal to the department and are completely behind the scenes, so we decided to introduce them to you. These individuals are our Industrial Advisory Board (IAB). The current Board consists of Bill Bennett (LHB), Paul Johnson (MBJ), Jim Foldesi (St. Louis County), Mike Tardy (Carlton County), Steve Marshik (Barr), Rob Wahlstrom (AET), Tom Donofrio (MN Power), and four new incoming members: Cari Pedersen (City of Duluth), Todd Campbell (MnDOT), Dianne Mathews (WLSSD), and Scott Kyrola (Northland Constructors). We greatly appreciate the service provided by these professionals. We are going to start providing a brief bio of two IAB members in each issue of the Civil Scoop. This issue features Mike Tardy, who has been on the IAB since the IAB started in 2008, and is leaving us at the end of his current term, and Bill Bennett who has been the IAB Chair since the IAB began. Bill Bennett is stepping down as Chair and Paul Johnson is taking over that obligation. We greatly appreciate both Mike and Bill and thought you might also like an opportunity to get to know them a little.



Bill Bennett

Bill is a registered Professional Engineer and serves as the CEO for LHB, a 260 person Engineering, Architectural, and Planning firm with three offices in Minnesota and one in Wisconsin. Bill graduated from Iowa State University with a Bachelor of Science in Civil Engineering in 1978. He has been actively engaged in economic development activities in Northern Minnesota and Wisconsin since 1980. He has been active with Board leadership for numerous business and professional related organizations throughout the region including the Minnesota Chamber of Commerce, the Greater Downtown Council, the Duluth Area Chamber of Commerce, the American Council of Engineering Companies of Minnesota, and the American Society of Civil Engineers. Bill has supported higher education and workforce development through his leadership and serving as Chair of the UMD Civil Engineering External Advisory Board and as a member of the UMD College of Engineering and Science External Advisory Board. He has been active in legislative advocacy for our region focusing on transportation, education, energy, and

general business related policy issues. In addition to the business and professional related organizations, Bill has also served on the United Way of Greater Duluth Board, Memorial Blood Centers and LISC Advisory Boards.



Michael Tardy

Michael Tardy received his bachelor's degree in Civil Engineering from the University of Minnesota in 1980. His previous work experiences include: district engineer for the Bureau of Land Management in Butte, Montana; bridge engineer for the California Department of Transportation in San Francisco and Sacramento; county engineer for the Cook County Highway Department in Grand Marais; assistant district engineer for state aid for the Minnesota Department of Transportation in Baxter and Duluth, Minnesota; and county engineer for the Carlton County Transportation Department. Michael has worked on many projects such as the Golden Gate Bridge deck replacement, Gunflint Trail, Sawbill Trail and Caribou Trail reconstruction projects, Cook County/Grand Marais Airport construction, Highway 53 Mall Project, Duluth I35 Mega Project, Virginia to Cook Highway 53 four-lane expansion, Grand Rapids Pokegama Avenue reconstruction, Cloquet and Moose Lake Airport improvements, and Holyoke Connector tire shred aggregate substitute project.

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Yes, I want to show my support for UMD Engineering Students. Please accept my gift of \$_____

Please direct this gift to:

____ UMD Civil Engineering Scholarship (5430)

____ UMD Civil Engineering General Program Support (6195)

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Minneapolis, MN 55786-0266

If questions, contact by mail:
Carrie Sutherland
Director of Development
Swenson College of Science and Engineering
140 Engineering Bldg
1303 Ordean Court
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