



Trimble R8 GPS Receiver Meets the Classroom

In the Fall of 2015, the Construction Surveying course introduced a new gadget to the classroom: the Trimble R8 GPS receiver and data collector. Students are able to work hands-on with the GPS system in two separate lab sections, enhancing their classroom experience as they learn all about GPS surveying. One lab is an introductory course in how to operate the equipment, and the next requires students to upload data into the data collector emulating construction processes. Dr. Matthew Stone says, “the biggest benefit of the equipment is showing the students the new technology as well as its impact in the construction industry.” Dr. Stone discussed the advantages of the GPS system as well as some limitations associated with GPS system use in the survey course. The course information coupled with the hands-on experience of using the equipment provides students with the fundamentals of how GPS works and when it can be best utilized in construction surveying. The course also includes how the system operates in conjunction with other programs such as Computer Aided Drafting (CAD) and Geographic Information Systems (GIS). The Department purchased a total of eight GPS systems with the purpose of improving student learning experiences.

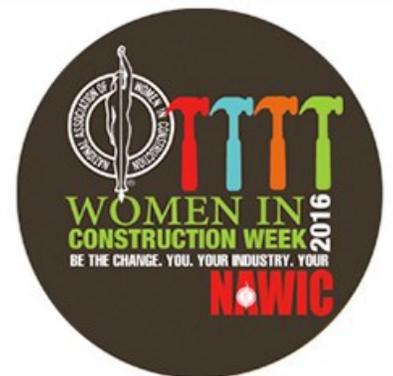
NDSU CONSTRUCTION MANAGEMENT AND ENGINEERING

NEWSLETTER

Spring 2016

Women in Construction

This year the department is excited to say we have 18 female students currently enrolled in various programs within the Construction Management & Engineering Department. This is a new all-time record; the last record was 17 female students in the mid-1990s!

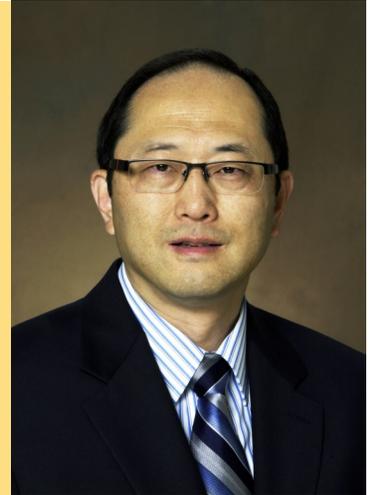


NDSU NORTH DAKOTA STATE UNIVERSITY

2 MESSAGE FROM THE CHAIR

Message from the Chair

It is my great pleasure to share the accomplishments of the Department of Construction Management and Engineering with you. In the past year, the Department has reached several milestones. First, our enrollment has increased by 15% two semesters in a row. The female enrollment reached an all time high since the Department was formed in 2005. The Department continues to invest resources to improve the students' learning experience; a total of 8 GPS Surveying Systems were purchased and utilized within the Construction Surveying course. To enhance our distance learning programs, the Department is building a video conference system that will be utilized to improve communication with students in the distance programs. Additionally, the Department invested resources to establish the Computational and Sustainable Infrastructure Laboratory. This lab is led by **Dr. Eric Asa**. Currently the Department is investing in establishing a Research Lab for **Dr. Todd Sirotiak** and **Dr. Matt Stone**. Within the last few years the Department has invested nearly \$500,000 to improve its teaching and learning environment.



In the last year, our research programs have achieved significant success. **Dr. Todd Sirotiak** received a grant from the Department of Energy for his work in sustainable construction material research. **Dr. Bradley Bowen** received a grant from the National Science Foundation for a research project called *Research Experience for Teachers*. **Dr. Eric Asa** and **Dr. Jerry Gao** received grants from ND Department of Commerce and arK Property Investments to develop a new green fly-ash geopolymer concrete. **Dr. Yang** is working with a faculty member from the Department of Architecture on a research project funded by the City of Fargo to find more fuel efficient options for the Fargo Vehicle Fleet. This also happens to be the highest dollar amount our department has ever received! These research funds help support graduate students in the Department. Currently we have 7 PhD students, another all time record for the Department.

We have recently welcomed a new faculty member; **Dr. Yao Yu** has joined the Department as an assistant professor. He is an excellent addition to the Built Environment Systems area that the Department is developing. The renovation of the Department office building (Engineering Building) was completed in early 2016. Pictures of the office updates can be viewed below. With state of the art facilities, dedicated faculty and staff members, the Department is well positioned to serve our students and produce high quality future leaders for the construction industry. Finally, I would like to thank you for your continued support of the Construction programs at NDSU.

Dr. Yong Bai, Chair and Professor



Mohammad M. Molla, Ph.D. Student

Mohammad Molla is currently pursuing Ph.D. in Construction Engineering and Management under the supervision of Dr. Matthew L. Stone at NDSU. He is working as a Graduate Research Assistant (GRA) for the Advanced Traffic Analysis Center (ATAC) in Upper Great Plains Transportation Institute-NDSU. As a GRA, he is currently working with three Metropolitan areas travel demand modeling; conduct model calibration and updating; support model improvements and enhancements; GIS mapping and updating the Department of Transportation University Support Center GIS Server. His core research interest is in Travel Demand Modeling, Transportation Planning, Safety, and GIS. His doctoral dissertation title is: "Virtual Sensor Crowdsourcing: A Novel Intelligence of Travel Time Data Collection Technique." Last year, Mohammad received the Best Student Paper Award at a North Dakota GIS conference for his paper titled "Leveraging Origin-Destination (O-D) Travel Time Data Collection Technique Using Google Maps API."



Students Win ASC Competition

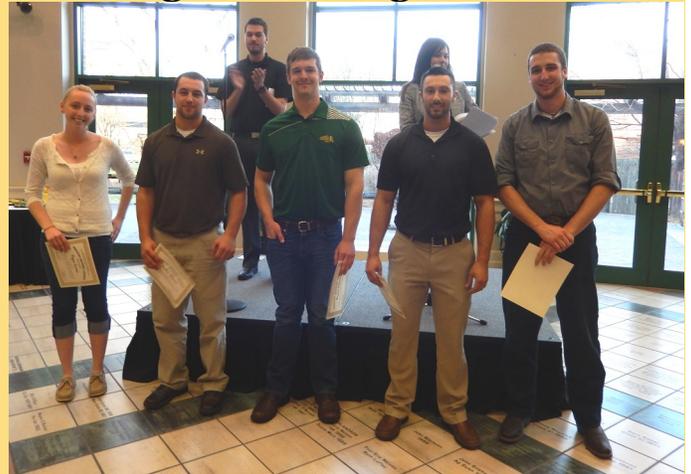
During October 21-24, 2015, a team of NDSU students took a trip to Nebraska City, Nebraska to compete in the North Central Region (region 4) of the Associated Schools of Construction (ASC) annual conference and competition. The students competed in four different divisions: Commercial, Design-Build, Heavy-Civil, and Specialty Contracting. The competition allows students to experience "real life" project management situations; within 18 hours students were challenged to schedule, estimate, run cost analyses, and resolve management issues that would typically come up during project planning. At the end the groups of students spoke in front of a panel of judges, explaining and presenting their proposals.

These judges consisted of representatives from many different avenues within the construction world. Our NDSU students were able to place top three in two categories this time around! In the commercial division, a team headed by Dr. Jongchul Song and consisting of Luke Capistrant, Aaron Janz, Joe Kasper, Matthew Paulsen, Chauntel Bergstrom, and Sam Manke placed third. In the specialty division, another team guiding by Dr. Jongchul Song also placed third! This team was comprised of Tony Leighow, Tyler Grandrud, Jacob Tretsvin, Carin Neseth, Brandon Davis, and Jason Kirschenheiter.

4 STUDENT NEWS

The Outstanding Graduating Senior Award was established by the Industry Advisory Council in 2001 “to recognize undergraduate student contributions to the growth and improvement of Construction Management and Engineering at NDSU, leadership in CM&E activities, academic achievement and professional potential as demonstrated while attending NDSU CM&E program of study.” The nominees in 2015 (pictured from L-R) were Megan Larson, Jordan Gleason, Bryan Silvers, Shane Hillen, and Seth Morken. The winner of this award was Jordan Gleason. He was presented with a check for \$500 as well as a plaque by Joanna Slominski, Co-Chair of IAC and Construction Engineering alum, and newly elected President of the Associated General Contractors (AGC) Student Chapter, Chase Baker.

Outstanding Graduating Senior Award



Grace Becker, Junior



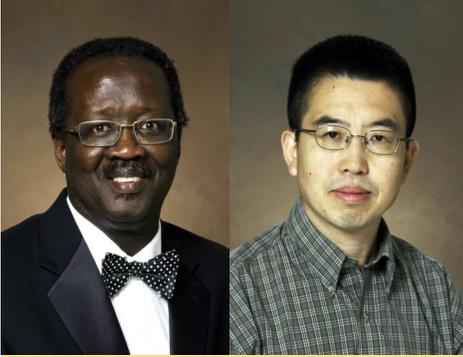
Grace Becker is a junior in the Construction Engineering program. Currently she is a member of the Associated General Contractors club, President of the Women’s Club Hockey Team, as well as an Engineering Ambassador. She is also serving on the Faculty Search Committee, a program leader at Gigi’s Playhouse and a personal trainer at 9Round Fitness. She is a well rounded, highly involved student, who somehow manages to still find time to give back to the community. On the left is a photo from her freshman year when the NDSU Women’s Club hockey team won the national championship. She is passionate about a career in construction engineering and is committed to sticking it through although there have been many obstacles. This summer she will be returning for an internship with Schwab LLC, where her passion for engineering was first sparked.

Scholarship Recipients

For the 2015 –2016 academic year, the following students of the Construction Management and Engineering Department have earned a total of \$51,437 in scholarships! Congratulations, and keep up your great work!

| | |
|----------------------------|--------------------|
| Wyatt Aberle | Austin Haas |
| Chase Baker | Jordan Hochhalter |
| Grace Becker | Aaron Janz |
| Chauntel Bergstrom | Joseph Kasper |
| Eric Burns | Elijah Kracht |
| Stephen Bush | Trevor Kraft |
| Luke Capistrant | Connor Mann |
| Nicholas Carlin (pictured) | Noah Morken |
| Taylor Carlson | Connor Schlotfeldt |
| Brittany Diederich | Landon Schmitz |
| Stephen Gaydos | Sean Vadnis |





Developing a New Green Concrete Using Fly Ash Waste in North Dakota

Dr. Jerry Gao and Dr. Eric Asa are working together with Dr. Mijia Yang, assistant professor in the Civil and Environmental Engineering Department on a project funded by the Department of Commerce and arK Property Investment. Their goal is to “develop a new green fly-ash geopolymer concrete, using fly-ashes produced locally in coal power plants in North Dakota.” This new green fly-ash geopolymer concrete would be implemented by arK Property Investment in residential construction

projects. If they are successful, the expected benefits would include reducing pollution for the state by turning waste into something more useful. The research team anticipates it “will be especially beneficial to our power plants.” The anticipated impacts include decreasing CO₂ emissions by reducing cement need and production within the concrete industry, as well as reducing waste impacts by recycling the fly-ash produced. A reduction in emissions coupled with the recycling process will increase environment-friendly conditions as well as sustainability without compromising the speed/efficiency needed for concrete construction.

This project was started in September of 2015, and it will span the course of three separate phases. The first and current phase involves analyzing the chemical composition of local fly-ashes produced. Next they will move on to experimenting with the effects of various additives that potentially could be used in conjunction with fly-ash to produce better geopolymer concrete. Lastly, they hope to develop a durable formula for fly-ash geopolymer concrete. This new concrete is anticipated to “reach similar properties as conventional concrete in terms of strength and stiffness” in a relatively short curing time. Aside from the Fly Ash project, Dr. Asa and Dr. Gao are both working on other projects as well. Dr. Asa is currently analyzing traffic data presented by the state from 2008-2013 regarding all reported traffic accidents. This project has been ongoing for about a year now. Using spatial statistics and traditional statistic, Dr. Asa is looking for trends in the data. So far a few interesting trends have surfaced. Here are a few samples from his data analysis: *The results...show that, almost 60% accidents happened during daylight...most accidents occurred on clear days (when there is no weather event). In all the crashes reported the top five most harmful events were motor vehicle in transport (57.2%), deer (16%), parked motor vehicle (5.6%), overturn/ rollover (4.9%) and ran off roadway (3%) accidents.* He hopes that this study will help the state target problems as well as problem areas in an effort to reduce traffic accidents.



Dr. Gao is also currently in the development stages for a virtual design concept in construction. He was struck by an interesting question or problem, that is how 3-D modeling can help make the construction process safer, faster, and more cost-effective. He is looking into combining building information modeling and GIS to develop EIM, an environmental information modeling database. By combining individual 3-D building models into the city’s current GIS, they can create a platform to more accurately check and plan construction projects. This platform would provide better control for city planning, more accurate as well as accessible compilation of data, give insight to hazard risks and prevention planning, etc. The project has a plethora of benefits even outside of the construction management aspect.

Experiments in Education



In collaboration with John Deere Electronic Solutions, Microsoft, Bobcat, Sanford Health, Ulteig Engineering, Moore Engineering, KLJ Engineering, and Caterpillar; along with the Greater Fargo-Moorhead Economic Development Corporation and the South East Education Cooperative, Dr. Bowen is participating in a program called “Educators in Industry” which places K12 teachers in a summer work experience for 4 weeks. This project has been ongoing since 2011, and has received \$54,000 in funded so far. Most recently, he received a grant for \$587,517 from the National Science Foundation for a research project called “Research Experiences for Teachers: Engineering in Precision Agriculture and Sustainability for Rural STEM Educators.” Research Experiences for Teachers (RET) is a comprehensive professional development program in engineering, research, and design, focused on providing knowledge, skills, and resources to middle and high school rural educators in science, mathematics, and technology education. The program's

theme, Precision Agriculture and Sustainability, is a 6-week summer research experience in the NDSU mechanical engineering department along with professional development workshops throughout the year. After completing the program, teachers will have critical resources for delivering course content with a renewed outlook on innovative teaching techniques creating increased student engagement and achievement in STEM fields. Five teachers will be selected to spend 6 weeks on campus gaining research experience focused on agriculture and sustainability. The project will start the Summer of 2016 and is anticipated to run through 2018. Currently, Dr. Bowen is finalizing the building/planning stages of the program. Recruitment started March 1st, and in April there will be a two-day workshop where the teachers will each be paired with an NDSU student in Teacher Education.

The Fargo Fleet Goes Green

Dr. Yang was recently hired in conjunction with Malini Srivastava, an assistant professor of architecture here at NDSU, by the City of Fargo to find more fuel efficient options for the Fargo Fleet. Since April of 2015, Dr. Yang has been looking into building or converting the current Fargo Fleet to run on compressed natural gas or CNG. The Fargo Fleet consists of the official vehicles vital to our city’s day to day life, such as waste management vehicles, school buses, police cars, etc. If the conversion from landfill gases to CNG goes smoothly, Dr. Yang and his partner(s) would accomplish a reduction in the large CO₂ emissions produced by the fleet currently, reduce the greenhouse effect, as well as reduce fuel costs. The use of CNG instead of diesel or gasoline for only the waste fleet will save the city of Fargo over \$ 200,000 every year. Currently Dr. Yang and his partner(s) are wrapping up phase one of their project, which is primarily a gathering of information and resources as well as hammering out a proposal for this transition to CNG. Next year, we hope to update you on the progress of this exciting project.



Using GIS as a Tool for Erosion and Sediment Control



Dr. Matthew Stone is an assistant professor whose research interests include: Life cycle cost analyses of heavy/highway construction, probabilistic cost estimating and scheduling, and geospatial information system (GIS) applications in the construction industry.

Dr. Stone has been working with the North Dakota Department of Transportation and Upper Great Plains Transportation Institute (UGPTI) in delivering a training course for erosion and sediment control construction courses. The idea for his current research project was sparked by conversations with the Department of Transportation about various issues they've encountered concerning stormwater, sediment, and erosion. Dr. Stone was faced with the questions of how to improve construction processes and how to overall prevent issues as well as help the environment. Although GIS has been used previously for larger scale projects, Dr. Stone believes GIS can be applied

to smaller projects as well. This application would allow for perspective on an entire project's life cycle, such as predicting the amount of soil loss that would occur during a project. This aspect would allow for designers and constructors on a smaller scale to more easily detect these "hot spots."

Currently Dr. Stone is working out the best ways to incorporate GIS in these smaller projects and how to link the soil erosion prediction in GIS with the project's stormwater pollution prevention plan (SWPPP). He is approaching the puzzle from an efficiency and safety standpoint. Part of his project has involved looking into the possibilities and practicalities of building/incorporating drones into the process. Although Dr. Stone is still in the early stages of his research, he foresees many practical benefits for the future of the construction industry. Aside from more easily detecting hot spots, the integration of computer programs would make comparing design models easier. The incorporation of drones could make inspection processes faster and safer; information can be networked in real-time through instantaneous data that would keep everyone on the team up to date and connected. The use of GIS would allow for more accurate measurements.



Cement Changes and Solutions to the Industry: Portland Limestone Cement



Dr. Todd Sirotiak received a grant from the Department of Energy titled *Cement Changes and Solutions to the Industry* as part of an endeavor to advance low environmental impact hydropower technologies with funding worth \$6.5 million towards the end of the Spring 2015 semester. The work regarding this grants will be focused on developing a concrete alternative that proves more effective for use in hydropower facilities. Ideally, the new concrete alternative will be capable of reducing shrinkage in concrete. Other aspects of the project include reducing the number of cracks in concrete as well as maximizing sustainability of the mix while still reducing its carbon footprint. Lastly, the final goal of the project will be to make the product as cost effective as possible. The Disruptive Technologies and Innovations (DTI) Lab Group is tackling this project in cooperation with Iowa State University, with Dr. Sirotiak heading the DTI group here at NDSU and Dr. Peter Taylor heading the ISU team.

The DTI group members include: Achintyamugdha Sharma, Ph.D. Student, Rajender Reddy Chada, Anam Malik, and Prokshit Abhinandan Angadi who are M.S. students. The group name stems from their goals of deconstructing existing technologies and bringing forth new innovations. The group also fancies themselves the nickname “the Misfits” around the office. The project focuses on the use of Portland Limestone Cement (PLC) as that concrete alternative previously mentioned. PLC has recently been accepted by the American Standards of



Testing Materials, so it is new to the construction scene here in the U.S..

During typical cement manufacture, there is a significant emission of CO₂ into the atmosphere. However, PLC can help in reducing this emission as it decreases the quantities of Portland cement produced. The new PLC will be designed to perform in a similar way as the conventional Portland cement is used in the industry. In the end, the researchers hope to bring about a product that will be more effective and sustainable, yet will not compromise price point or environmental friendliness.



Dr. Yong Bai, chair and professor, is conducting research in the areas of infrastructure construction and maintenance, highway work zone safety, international construction management, and emerging technologies in construction. He was the co-chair for the International Conference on Construction and Real Estate Management in Lulea, Sweden from August 11-12 of 2015. During that conference he gave a keynote speech on “Enhancing Highway Work Zone Safety Using Portable Changeable Message Signs.” In September 2015, Dr. Bai brought several chairs from the College of Engineering to visit two Universities in China to build relations and open the doors to potential collaborations. Dr. Bai is the co-chair of the Technical Committee for the 11th Asia Pacific Transportation Development Conference which is held in Hsinchu, Taiwan from May 27-29 of 2016.

Dr. Bai Led China Visit



Asphalt Pavement Cooling and Computer Vision Application

Dr. Jongchul Song is an assistant professor pursuing research in three areas: (1) field assessment of as-built building energy efficiency, (2) field assessment of asphalt pavement thermal properties, and (3) asphalt pavement QA/QC. He is currently putting the final touches on his recent work with a graduate student that builds on Dr. Song's previous work. He hopes to have finished drafting the report for publishing this semester. This drafting is a general article that will combine this student's thesis work with Dr. Song's previous work on asphalt pavement cooling. Aside from finishing this draft, Dr. Song and two master's students began a new project last year. They were struck with two interesting questions: 1) In what ways can they apply computer vision technology to construction? 2) How can one automatically measure as-built quantities of earth work? Currently Dr. Song and each student involved are researching down different paths related to ways to incorporate/apply computer vision to construction projects. The project is still in the conceptual phase, but the idea is that they would be able to combine different methods of camera use and computer frameworks as well as with some new or modified algorithm. This combination would then be tested on actual construction sites. Although the project is still in Phase 1 (gathering background information, idea building, conceptualizing, etc.), the group is excited to be exploring unknown territory. The three of them are journeying down a road none of them have been on. Towards the end of Phase 1 the group hopes to better define their research problem once more background information has been compiled. When asked about how his experience has been leading the research, Dr. Song chuckled and responded "there are many methods of mentoring...and we are all learning together." This change of direction in research has many potential benefits, though. Dr. Song anticipates this research project can help future contractors better determine the as-built quantities of earth work to be done by simply using a digital camera. These 2D images will then be converted into 3D models of site topology. This information and these models will save contractors time, will help estimate earthwork costs as well as validate their estimates. Other benefits include allowing better management of input-to-productivity ratios. For example, this technology can show how productive a particular piece of construction equipment really is or has the potential to be. They hope to continue to progress in this research project in the near future, and look forward to reporting their progress in the next newsletter.



A Special Thank You to Staff

Ingrid Scarski (left) has dedicated the last 30 years to our NDSU community. On April 13th, 2016 she will be recognized and honored for her 30 years of service. Ingrid Scarski started April 7, 1986 in the Registrar's Office (now called Registration and Records Office). Then a little over a year later she began working for the Department of Construction Management and Engineering. In 1997 Scarski was honored with a plaque of appreciation and discovered that a new scholarship had been created and named in her honor! Since 1999 the Ingrid Scarski Scholarship has been awarded annually to students. Many years ago, in the face of this praise she simply answered, "The students bring out the best in me! They make my job worth coming to." Now after 30 years of service, her response is still the same. Ann Denney (right) has worked at NDSU for the past 10 years. She started in the Department of Architecture, then she split her time between Industrial and Manufacturing Engineering and Construction Management and Engineering, until she joined the Department full time in 2007. She has been a welcome asset to the department, and last Spring was honored for her 10 years of service at NDSU. The Department thanks you for your contributions.



An Update from Jordan Gleason

After graduating in May 2015, Jordan Gleason went to work for Construction Engineers, a mid-sized general contractor and construction manager based out of Grand Forks, ND. He spent his first 5 months (May-September) working as an estimator in the Grand Forks office. In this position he bid public (hard-bid), private (negotiated), and construction management at risk projects. In October, Gleason moved to Watford City, ND to fill a role as field engineer on the McKenzie County Combined Law Enforcement Center Project. This is a 94,000 square foot, \$47,000,000 facility that is scheduled to be complete in March, 2017.



An Update from Brent Finley



Brent Finley graduated from NDSU in May of 2015 with a B.S. in Construction Engineering. He started working for Hensel Phelps right after graduation on a hospital remodel project. Currently, Finley is assigned to an exciting project in the heart of downtown Fort Collins. In the next couple of weeks, he will be putting in the primary control for the entire project so he's excited to have to open up his surveying book again! It is a 5 story hotel with a 3 level parking garage next door. The project management team is using a ton of technology to manage this project, such as BIM for subcontractor coordination so they can solve problems before they become issues in the field. They will also be using 3D laser scanning to as-built the steel tendons for the PT concrete deck before each placement so they know exactly where those tendons are at. Brent Finley says, "It's going to be a great project, and I'm excited to be a part of it!"

An Update from Seth Morken

Seth Morken graduated with a BS in Construction Engineering in May 2015. Since graduating, he has been working in the Construction Services Department at JLG Architects in Fargo, ND. In his time at JLG, he has been involved in the Construction Administration of many projects in the area ranging from a small park shelter project to the Sanford Medical Center. Seth Morken is also involved in many projects through the design process in estimating and constructability reviews and discussions. His experience at JLG has been fantastic, and he looks forward to many years of success here.



Associated General Contractors of America

The Associated General Contractors of America (AGC) is an organization designed to promote relationships among students and industry professionals. The NDSU student chapter of AGC hosts industry speakers, organizes site visits, and competes in the annual ASC competition. Since Fall 2015, AGC has welcomed a new president, Chase Baker. Under his leadership, the Chapter renewed the highway adopt program with Minnesota DOT, as in the past, the student chapter provided highway clean up. The chapter organized student volunteers to provide a White Glove service helping companies set up and tear down for the NDSU Engineering & Tech Expo held each fall. The group also provides this service to companies during the annual spring Career Fair. The AGC officers attended the annual AGC of ND Convention to reach out to the construction industry people. The chapter held monthly meetings open to any interested students where industry people gave talks. The Chapter also organized a few field trips to the new Fargo Sanford Medical Center project and participated in the ASC competition where they placed 3rd in two separate categories as mentioned previously in the newsletter.



National Association of Home Builders

The National Association of Home Builders (NAHB) NDSU Chapter meets to have discussions with industry professionals and learn about real-world construction practices. This organization allows students to participate in conversations and activities that build their knowledge and network in the home building sector. Students in the NAHB Chapter may also compete in the Residential Construction Management Competition (RCMC). This competition is held annually as a comprehensive way of engaging students in a design project focused on the development and design of a residential community. This project takes place in the fall with a final presentation at the International Builders' Show. NDSU was also a Platinum Honoree for attending the conference for the last 20 years.



Sigma Lambda Chi

Sigma Lambda Chi is an international construction honor society that gives construction students the opportunity to be recognized for their academic achievements and gain connections with industry professionals. The following people were named new members of Sigma Lambda Chi in Spring 2015:

Jordan H. Bartsch
Ryan Beyer
Kenechukwu C. Ezekwem

Seth E. Morken
Dr. Matthew L. Stone
Dr. Todd Sirotiak



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CM&E Degree Programs and Spring 2016 Enrollment

| | |
|---|-----|
| Bachelor of Science in Construction Engineering | 40 |
| Bachelor of Science in Construction Management | 172 |
| Graduate Certificate in Construction Management (online) | 3 |
| Master of Construction Management (online) | 24 |
| Master of Science in Construction Management | 9 |
| Doctor of Philosophy with an emphasis in Construction Engineering | 7 |

2014-2015 CM&E Graduates

| | |
|--|----|
| Bachelor of Science in Construction Engineering | 5 |
| Bachelor of Science in Construction Management | 37 |
| Master of Construction Management (online) | 6 |
| Master of Science in Construction Management | 4 |
| Graduate Certificate in Construction Management (online) | 1 |

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