

THE ILLINI SPECIAL

Produced by the AREMA Student Chapter of the University of Illinois at Urbana-Champaign

Fall 2010 Edition

ABOUT OUR CHAPTER

The American Railway Engineering and Maintenance-of-Way Association's (AREMA) Student Chapter at the University of Illinois at Urbana-Champaign is a student-run organization whose purpose is to expose students of diverse backgrounds to the expansive field of Railroad Transportation and Engineering through organization of field trips to rail yards, manufacturing facilities, conferences and more, as well as facilitating contact with leaders in the rail industry and academia. This newsletter seeks to further these goals with articles about the rail curriculum at Illinois to guide those just entering or considering the program, descriptions of graduate research for those interested in getting involved beyond their existing coursework, and summaries of our recent field trips for those who were unable to attend. We hope this will be the first of many newsletters detailing the activities of our student body, and we wish to warmly welcome our inaugural readers!



Members of the chapter with students from CEE 408 and 409 on a recent fieldtrip to the Monticello Railroad Museum

RAIL IN THE CLASSROOM @ ILLINOIS

So you're interested in railroading but don't know where to start? UIUC offers six classes in various railway engineering topics which can help you get on-track. No other university in North America offers this kind of in-depth coursework to students; having a few of these courses on your transcript will make you very attractive to potential employers!

Railroad Transportation Engineering (CEE 408, taught by Prof. Chris Barkan, offered Fall semesters) provides an overview of the many facets of railway engineering. The course covers railroad transportation efficiency, train power and resistance, operations and mechanical engineering. The course focuses mainly on the rail freight industry, but also looks at passenger and other types of rail transport. A portion of the course focuses on transportation economics—the allocation of resources within a transportation system and the demands on the system.

Railroad Track Engineering (CEE 409, taught by Prof. Donald Uzarski, offered Fall semesters) focuses on railway track system design, construction, evaluation, maintenance, load distribution, and wheel-rail interaction in the track structure. Different industry standards and design methods are examined and applied with an extensive design project as part of the course.

Railway Signaling and Control (CEE 410, taught by Prof. Chris Barkan, offered Spring semesters) focuses on the facili-

ties, operating practices, and control systems used to safely and efficiently move trains. Train resistance, power, speed, and acceleration are examined. From there, stringline diagrams, scheduling and stopping distance are covered. Principal topics include train movement authority, train position monitoring systems, and train control systems.

Railroad System Planning and Design (CEE 498RD, taught by J. Riley Edwards, offered Spring semesters) examines the process of planning and designing a railroad project from concept to construction. The course examines the economic analysis, planning, design, and construction of railroads. Topics will include project alternatives, routing alternatives, and environmental impact. The course includes instruction in MicroStation CAD software and route surveying. Past students have enjoyed learning surveying skills in this 4 credit hour course. The design project, a major component of this course, requires work outside of class but provides valuable experience in railroad project management.

Other courses to consider include High-Speed Rail Engineering (CEE 498HSR/598HSR, taught by Dr. Tsung-Chung Kao and Prof. Chris Barkan, offered TBD) and Advances in Rail Technology (CEE 598AR, taught by Prof. Chris Barkan, offered TBD). Additional course information can be found on the Railroad Engineering Program website at: ict.illinois.edu/railroad/default.asp.

UPCOMING EVENTS:

First Hay Seminar of semester: January 28

First Chapter Meeting of semester: February 2

CEE Career Fair: February 25

AREMA Scholarship Applications due: March 11

Engineering Open House: March 11-12





Newly-built High Speed Rail track in Italy

ILLINI IN THE FIELD: FRANCESCO BEDINI

Last July, I had the opportunity to work on the construction site of the high speed rail line from Bologna to Florence, Italy. I was assigned to work with Mr. Piero Perotti, who was responsible for track superstructure design and construction. Specifically, he dealt with track and power systems. When I arrived on site, the line was substantially complete and had already been handed over by the general contractor to the Italian railroad operator—Rete Ferroviaria Italiana (RFI).

During my time there, I spent no more than 30 minutes a day in the base camp office. The rest of the day, we would visit various points along the line to inspect cabling and lighting in tunnels as well as to test safety features such as tunnel escape exits and venting systems. We took pictures of anything anomalous and forwarded these photos to the main RFI office in Bologna.

One of the most interesting experiences was the discovery of a vein of hydrogen sulphide near the access window to a tunnel about halfway between Bologna and Florence. The vein infected the nearby water table, causing substantial damage to cabling installed along the access window. The cabling powered the ventilation systems in one of the tunnel's control rooms. This issue caused a major headache for the RFI. After a series of meetings and discussions, geologists were hired to do an inspection of the soil overlaying the tunnel in order to find the contaminated water table and to find the source of the sulphide vein.

Another memorable event was the fire system testing. A simulation of a train on fire occurred one night while train service was not in operation. The 30 minute test was required by RFI for compliance with Italian safety standards. The purpose of the test was to verify that smoke did not enter the escape chamber located in the tunnel. To achieve this, the venting system has to generate enough pressure to confine any fumes in the tunnel while allowing passengers to escape to safety.

A month was a very short time to be involved with the project, but I gained tremendous insight into the construction and operation of an Italian high speed rail line. Having this experience will be valuable for me, as now is an exciting time for high-speed rail in the U.S.

AREMA ANNUAL CONFERENCE ATTENDANCE — LOOKING BACK AND LOOKING FORWARD

Where do students go to meet industry professionals, learn about new challenges and technologies, contribute to industry design recommendations, and ride Space Mountain? For nineteen members of the AREMA Student Chapter, the 2010 AREMA Annual Conference & Exhibition in Orlando, Florida was the setting for these activities. AREMA, the primary professional organization for railway engineers, hosts the conference each year. Last year, over one thousand rail industry professionals met from August 29th to September 1st to discuss engineering issues pertinent to the railroad industry and learn about new railway technologies.

According to AREMA Student Chapter President Philip Hyma, students who attend the conference benefit from the opportunity to network with industry leaders and learn about advances in railroad technology. Hyma also said that networking at the conference gives students an advantage when pursuing jobs in the field of railway engineering.

A variety of technical presentations and committee meetings gave students the opportunity to learn more about interesting topics. Graduate student Xiang Liu attended many technical presentations while in Orlando and said that he benefitted from learning about the current engineering challenges in the industry. He said understanding industry opinions helps him realize big picture ideas that are often difficult to appreciate in an academic setting.

Many AREMA technical committees held meetings in conjunction with general conference meetings and technical sessions. In committee meetings, best engineering practices are discussed and compiled to form the AREMA Manual, the de facto design recommendations for the railroad industry. Francesco Bedini, a graduate student who attended meetings of Committee 17 (High Speed Rail Systems) said he was able to contribute during the meetings based on his experience working in Italy with high speed rail systems.

The conference also included an event for students to learn more about careers in railroad engineering called “Meet The Next Generation”. Students benefitted from the opportunity to network and submit resumes to many companies at the railroad focused job fair.

In hopes of starting a new tradition at the AREMA conference, students and faculty organized an alumni dinner for UIUC graduates. Hyma said the dinner was a highlight of the conference, with over thirty people able to attend. The dinner was sponsored by UIUC and Hanson Professional Services, Inc.

The student chapter executive council successfully planned the trip and secured funding to support 19 students with help from Prof. Christopher Barkan and Chapter Advisor Riley Edwards. The student chapter looks forward to attending the AREMA conference next year in Minneapolis, Minnesota.



STUDENT SPOTLIGHT: RYAN KERNES

This issue, we met up with Ryan Kernes, a first year graduate student in the Railroad Engineering Program, to discuss his research and advice for those interested in participating in research.

Steven: Good afternoon Ryan, I'm glad you could take some time out of your schedule to do an interview for the newsletter. Could you give to us an overview of the research in which you are currently involved?

Ryan: Sure, Steven. My research focuses on improving the performance of concrete railway cross-ties by identifying and characterizing mechanisms that contribute to rail seat deterioration (RSD). RSD, defined as the loss of concrete material beneath the rail, has been identified as one of the primary factors limiting concrete tie service life.

S: On what aspects are you personally focusing?

R: I'll be focusing on the abrasion mechanisms that contribute to RSD. The purpose of this study is to define and characterize abrasion in order to facilitate an improved understanding of the criticality of abrasion as a failure mechanism. I am in the process of designing an experiment to measure the abrasion resistance of various rail seat surfaces.

S: Intriguing. Who else is involved in this research? What other work is currently being performed in the area of concrete ties?

R: Mauricio Gutierrez, a second year graduate student, is performing full-scale tests that focus on the performance of fastening

systems under severe service conditions. The full scale testing machine used for these test is housed at ATREL (The Advanced Transportation Research and Engineering Laboratory) and is sponsored by Amsted / Unit Rail.

S: What sort of an impact do you see this having on your academic or professional life?

R: A few benefits of doing research are that it forces you to think at a higher level than that expected for general coursework; you learn how to dissect and analyze a problem, it assists with technical writing and presentation skills, and I guess there is an aspect of this project that will be helpful in the future, as it is closely tied with the industry.

S: Before we close, are there any suggestions you have for those looking to do research?

R: Of course! It's never too early to start doing research, so I'd suggest that you first find your interests, then search for professors who are involved in those fields, and contact them; be active, as these opportunities won't just present themselves.

S: Thanks Ryan, that was certainly informative and I'm sure your advice will be beneficial to our readers.

R: Thanks for coming by.

To learn more about opportunities to assist with research, contact a member of the Railroad Engineering Program or send an e-mail to aremauiuc@gmail.com.

FIELD TRIP TO THE TRT

After attending the AREMA Annual Conference in Orlando this year, the chapter felt well exposed to the broad horizons of the railroad industry. Little did we know that within a few months, that exposure would be deepened by witnessing the premier Track Replacement Train in the country—the TRT 909, up close and in action. Fortunately for us, in early November, work was taking place on Union Pacific's (UP) mainline, just south of Springfield, IL as a part of the construction of a new high speed rail line from Chicago to St. Louis. After a quick drive to UP's field office where the 200+ on site workers and subcontractors are managed, we were given a safety briefing by UP Project Manager John Jerome and then headed to the project site for an additional safety briefing by our guide, UP Supervisor Darrell Anderson.

Setting off along an adjoining bike path, we first encountered a rail welding truck making a thermite weld where the TRT had been operating the previous evening. A few steps farther down the path and we came upon the massive, yellow rear end of the TRT 909. When we found a clearing in the brush to watch the machine work, our guide explained the various capabilities of the TRT as gantry cranes carrying rows of wood and concrete ties whizzed along the top of the train at a blistering 20 mph. The means through which the train is able to realize such astounding productivity (averaging 4,300 ties per day) became clear while watching the machine; each element of the TRT's operation is designed to perform its task at peak efficiency, and any critical component can be quickly replaced in the event of malfunction.



AREMA SC students on new track with UP Representatives

In the time our guide spent explaining the operation, we watched as old rail and wood cross-ties were removed, a level roadbed was cleared and new 136 lb rail was fastened on concrete ties. Close behind the TRT, a rail train gathered the old strands of continuously welded rail (CWR) in quarter-mile segments, followed by a surfacing gang with five tampers, six regulators and one double broom. The TRT is supported by six ballast trains as well as numerous other pieces of machinery managed by the project's five supervisors on-site. For the sixteen students and faculty who were able to attend, the exposure to production track replacement was unparalleled and will hopefully be the first of many trips the Student Chapter takes to view infrastructure upgrades supporting improved passenger rail service here in the Midwest.

LIST OF CONTRIBUTORS

Writers

Francesco Bedini
Charles Gross
Ryan Kernes
Steven LaRue
Calvin Nutt

Editing/Layout

Charles Gross
Samantha Chadwick

Train Art

Kelsey Householder

Photos

Francesco Bedini
Professor Chris Barkan
Professor Don Uzarski

Faculty Advisors

Riley Edwards
Professor Chris Barkan
Professor Don Uzarski
Dr. Rapik Saat

For more information about the UIUC AREMA Student Chapter, please visit our website:

[http://ict.illinois.edu/railroad/CEE/Railroad Students/AREMA.asp](http://ict.illinois.edu/railroad/CEE/Railroad%20Students/AREMA.asp)

aremauiuc@gmail.com

TO OUR SPONSORS — THANK YOU!



- University of Illinois Student Organization Resource Fee
- George Krambles Transportation Scholarship Fund
- RailTEC

THANK YOU TO THE FOLLOWING COMPANIES FOR FACILITATING OUR FIELD TRIPS:

- GE Locomotives
- BNSF
- Union Pacific
- Metra
- CSX

AREMA Student Chapter at UIUC
Newmark Civil Engineering Lab
205 N. Mathews Ave, B118
Urbana, IL 61801