

Railroad Engineering Education Symposium (REES)

University of Illinois at Urbana-Champaign & AREMA Committee 24

1.0 Background

The rapid growth in North American rail transportation demand, combined with high rates of retirement has resulted in a substantial increase in the industry's need to hire new engineering graduates. However, railroad engineering content is extremely limited in the civil and transportation-engineering courses in most North American universities as documented by surveys conducted by AREMA Committee 24 and data analysis conducted by Lautala [1, 2]. This is due to the small size of the railroad academic community. Increasing this will require effort and support from the railroad community. The small number of faculty and programs in railroad engineering means that there is not the critical mass among academics necessary to sustain development and exchange of ideas, students and research. This creates a barrier to entry that discourages interested young faculty from entering the field because there are very few options or support for them to learn about it.

This is critically important problem for an industry trying to hire a new generation of engineering professionals because professors play a critical role in guiding students toward possible career opportunities. Since most professors are unaware of the career opportunities in railroad engineering they are not in a position to advise them about such. Conversely, the almost exclusive focus on highway transportation creates a large body of graduates who understand and are interested in careers in highway engineering and transportation. Consequently, raising the visibility of railroad engineering in the college environment is vital to increasing the number of college students interested in pursuing careers in railroad transportation engineering.

2.0 Objectives

The objective of the Railroad Engineering Education Symposium is to develop interest among university faculty in railroad transportation engineering with the goal of facilitating and supporting their interest in adding railroad engineering content to their engineering courses and curricula. Surveys of university professors conducted by AREMA Committee 24 found that there is interest among civil and transportation engineering professors throughout North America in learning more about rail transport and adding it to their curriculum [1, 2]. The challenge is to provide that information to them. The goal of the symposium is to respond to that interest by bringing them together along with faculty who specialize in railway engineering and other interested members of the rail engineering community to provide them with materials and teach them what they need in order to use it effectively.

The amount of material that professors expressed interest in incorporating into their engineering curriculum varied from a single lecture up to a semester-long course in railroad engineering. To accommodate these varied levels of interest a flexible approach is needed. Materials for a single introductory lecture will be provided, and then depending on the level of interest, one or more additional lecture modules introducing more detail on specific topics such as track structure,

rolling stock, traffic control, and operations can also be provided. In general, lectures would be developed in a modular system that would allow the individual professor and institution to choose the amount of railroad engineering content suitable for their interest and needs.

A complementary objective of the symposium would be to introduce faculty to research needs, opportunities and potential funding sources in railway engineering. For professors at most universities this is an essential component. Faculty members are expected to conduct research, supervise graduate students and advance the field in their area of specialty. The courses they develop and teach are generally a direct reflection of their research area. Consequently, to engage faculty members' interest in teaching railroad engineering, they must understand the opportunities for research as well.

3.0 Approach

To address the aforementioned issues, we have invited professors who have expressed interest in teaching railroad engineering to attend the Railway Engineering Education Symposium held on the campus of the University of Illinois at Urbana-Champaign. The purpose of the symposium would be to provide them with materials, give presentations, host discussions of the material and organize other activities intended to educate them about rail transportation engineering. The objective is to familiarize them with the resources they need to effectively teach railroad engineering at their respective colleges and universities.

4.0 Railroad Engineering Education Symposium

4.1 Overview of Symposium

The format for the REES will include two days of classroom instruction and discussion and a half-day visit to a local railroad facility with significant engineering, mechanical and transportation operations. The classroom portion of the symposium will involve presentation and discussion of the lecture material to be provided to professors. Time will also be set aside for presentation and discussion of railroad research activities and opportunities, and the current state of railroad engineering education in North America. The field visit will give professors the chance to see the railroad environment first hand and illustrate the possibility of conducting organized field trips in cooperation with railroads near their respective institutions as part of their instructional activities.

4.2 Preliminary Agenda

The schedule for the REES event includes two days of classroom instruction and discussion as well as a field trip to a nearby Class I railroad facility that has substantial engineering, mechanical and transportation operations.

The preliminary agenda for the Railroad Engineering Education Symposium is as follows:

- Introduction and overview of REES objectives
- Objectives and value of providing Railroad Engineering lectures in introductory Transportation Engineering classes
- Overview of Current Railroad Engineering classes and research programs in North America

- Presentation of Railroad Engineering material including the following modules:
 - Introduction to Railroad Engineering
 - Railroad Infrastructure
 - Railroad Power, Resistance, and Acceleration
 - Railroad Intermodal Transportation
 - Passenger Rail (Transit, Commuter, and Intercity Rail)
 - Railroad Capacity
- Overview of example homework and exam questions and solutions
- Overview of current Railroad Engineering research and future research needs
- Discussion of possible Railroad Engineering research opportunities and funding Sources
- Field visit to a local Class I railroad facility that has substantial engineering, mechanical and transportation operations

4.3 Attendees

Confirmed attendees include 28 professors interested in teaching railroad engineering. In addition, members of the railroad academic community are encouraged to participate. Also, representatives from the AAR, FRA, IDOT and individual railroads are invited to attend. This diverse group will provide a background for an in-depth discussion of railroad engineering principles as well as research, teaching, and career opportunities.

4.4 Symposium Deliverables

At the end of this event, the invited professors will be provided with presentation material pertaining to railroad engineering in the form of lecture modules. Example exam and homework questions and solutions, a list of publications, and other sources of instructional resources will also be provided. In addition, a contact list of both industry and academic contacts will be provided to professors attending the event.

4.5 Symposium Location and Dates

The symposium will be held on the campus of the University of Illinois at Urbana-Champaign on 8-11 June 2008. Local railroads have agreed to host tours of various facilities related to engineering, mechanical and transportation aspects of railroad transportation.

5.0 Summary

The need to maintain and expand the capacity of North American railroads to accommodate the increasing transportation demand being placed upon them is greater now than at any time in recent memory. The consequent need for a new generation of capable, well-educated railway engineering professionals to plan, design, build, maintain, and operate the rail transportation system is vital to the industry's ability to effectively and efficiently meet this need. The academic resources needed to satisfy the educational demand are presently in short supply at North American universities. In order to increase the visibility of rail engineering as a viable career path and to provide the education needed to pursue this career, a broader segment of colleges and universities must become engaged in teaching the principles of railroad transportation engineering.

The Railroad Engineering Professor Training Symposium is a critical first step in introducing a new generation of engineering faculty to the field and providing them with the materials and support they need to re-establish railroad engineering education as part of North American college and university engineering curricula. This will contribute to a sustained increase in the number of college engineering graduates interested in railroad engineering and therefore more likely to pursue careers in the railroad industry.

6.0 References

1. Lautala, P., *From Classroom to Rail Industry – A Rail Engineer in the Making*. Proceedings of the American Railway Engineering and Maintenance of Way Association (AREMA) 2007 Annual Conference, Chicago, IL (September 2007).
2. Lautala, P., *Development of University-Industry Partnerships in Railroad Engineering Education*. Ph.D. Dissertation, Department of Civil and Environmental Engineering, Michigan Technological University, Houghton, Michigan (2007).