THOMAS D. LARSON TRANSPORTATION INSTITUTE

The Thomas D. Larson Pennsylvania Transportation Institute of the Pennsylvania State University is the coordinator of transportation education and research for the University. As a component of the College of Engineering, the Institute offers a wide array of transportation research services to corporations, governments and transportation service organizations throughout the nation – addressing issues of import within all modes of transport.

Among the Institute's key services is the operation of the nation's Bus Research and Testing Center, funded by the Federal Transit Administration and tasked with the testing of all forms of motor bus equipment employed in mass transit service throughout the nation. The Institute is also the home of a Crash Safety Facility, Hybrid Vehicle Lab, Pavement laboratories and the Center for Dirt and Gravel Roads Studies.

While much of the Institute activity is focused on highway and mass transit topics, the University is also significantly involved in the railroad arena. A new degree program in Rail Transportation Engineering is being offered by the University, through which students can earn degrees specializing in the transportation and engineering aspects of railroading through a dedicated program presented at the campus in Altoona, Pennsylvania, the former heart of the Pennsylvania Railroad.

Penn State's Rail Transportation *Engineering Program*

The Rail Transportation Engineering degree at Penn State's Altoona campus provides opportunities for students and industry partners to participate in the worldwide resurgence of rail transportation. A focused engineering degree has been created for serious students who see their future in an area that is drawing increasing public attention. Rail Transportation Engineering majors pursue a curriculum based upon Civil Engineering but with added courses related specifically to transportation and rail. Students will take three hands-on "practicum" courses allowing them to work with real railroad equipment. One practicum relates to track, one to cars and locomotives, and one to the operation of trains. Students will use modern equipment to learn the fundamentals of train operations. They will work on the ground with real track and real locomotives and will work to solve the real problems of active railroading. At the same time, students will be learning the base knowledge and skills required of all engineers through a series of basic engineering courses.

Moreover, the Rail Transportation Engineering Program offers training in business fundamentals to enable the student to see how railroads connect with society at large and how and why railroads are useful. The student will take courses in the history and regulatory structure of railroads, accounting, and project management. Woven into these courses will be units on labor relations, the relationship between railroads and the federal, state, and local governments, and an introduction to the real estate issues affecting railroads.

Research

Program faculty members are working on externally funded research, too. For example, Professor Hai Huang, a faculty research associate at Penn State's Larson Transportation Institute, just finished a Federal Railroad Administration (FRA) funded project on "Dynamic Track Model Development for US High Speed Rail." He is currently leading a research team on a new FRA funded project "Modeling and Field Investigation of Track Performances under Trains Moving at 'Critical Speed.'" "Critical Speed" was originally defined as the speed at which moving trains resonate with waves traveling in the low modulus subgrade soil and produce excessive amount of ground vibration. It has been considered one of the most critical factors affecting High Speed Rail (HSR) safety and precluding higher speed operations. In United States, although dramatic amplified rail and soil vibration have not yet been observed due to the fact that heavier rail is used and the train speed is not as high as other high speed operations around the world, this condition may become critical in the future as train speeds are increased. This research is a major collaborative effort between multiple universities (Penn State and UMass-Amherst) and the rail industry (AMTRAK & HyGround Engineering) to better understand track and ground vibrations and substructure performances under trains moving at "Critical Speeds."

Both numerical simulations and field instrumentation and investigations will be conducted. Track performances will be monitored over a period of three years before conclusions are reached and formal recommendations are made.

Dr. Huang is also working as the Co-PI of a project supported by USDOT Research and Innovative Technology Administration (RITA) on automated track inspection system led by UMass-Lowell.

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