New lab

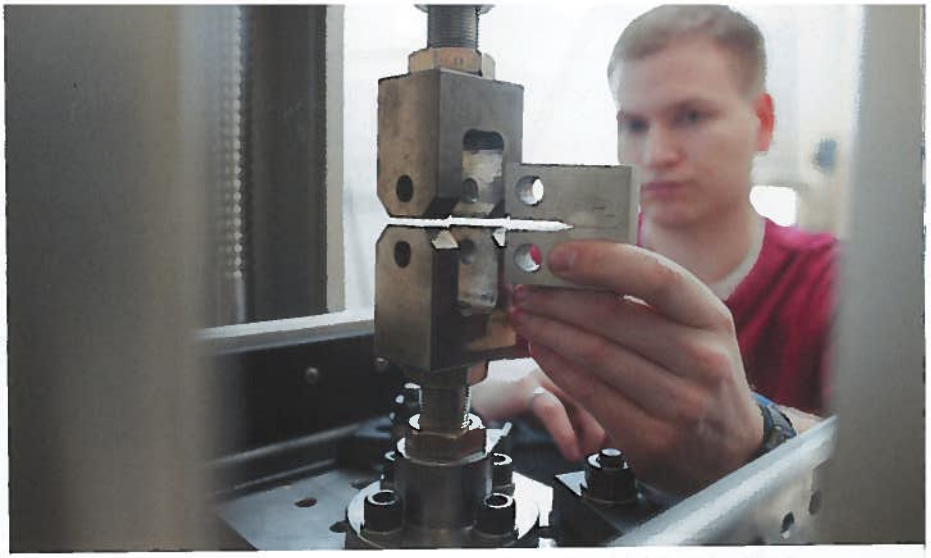
will tackle Canadian railway geographical challenges

Dr. Derek Martin, director of CaRRL, was awarded an Alberta Innovates Technology Futures Tier 1 Industry Chair in Railway Geomechanics, as well as an NSERC Industrial Research Chair in Railway Geomechanics.

Operating a scheduled railway means keeping trains moving. Reducing delays resulting from rock and snow slides and roadbed-related track failures is a key priority for Canadian railways.

To delve into these and other issues, the railway industry and the federal government have joined forces to create the Canadian Rail Research Laboratory (CaRRL) at the Edmonton campus of the University of Alberta. Other partners in the venture are Alberta Innovates Technology Futures (AITF), the Association of American Railroads (AAR), CP, CN, National Research Council Canada, the University of Alberta and Transport Canada.

Funding for CaRRL during the next five years will come from Transport Canada ($1.1 million), AITF ($1 million), AAR, CP and CN ($500,000 each) and the Natural Sciences and Engineering Council ($1.5 million). Dr. Derek Martin, director of CaRRL, was awarded an Alberta Innovates Technology Futures Tier 1 Industry Chair in Railway Geomechanics, as well as an NSERC Industrial Research Chair in Railway Geomechanics.



Mike Lowenger, vice president of the Railway Association of Canada, says the impetus for creating the lab came from the recommendations of the 2007 Railway Safety Panel report that called for more use of technology to improve the safety of train operations.

The Railroad Research Advisory Board of Canada took up the proposal and garnered financial support to create the lab with a mandate to study the geo-mechanical challenges facing Canadian railways while training a new generation of engineers trained in railway design and operations.

CaRRL will work in cooperation with AAR's Transportation Technology Center at Pueblo, Colo., and build on the center's existing and ongoing research. It will also team up with programs at other American institutions, including the University of Illinois, Virginia Tech and Texas A&M.

Lowenger points out that Canadian railways have to contend with a far harsher winter than most American carriers encounter. "We wanted a facility in Canada that would focus on hazard management technology. We want a lab that looks at matters we consider important."

Dwight Tays, chief of Engineering Technology with CN, who helped bring the lab to fruition, says the AAR-sponsored U.S. research network has produced a lot of benefits for Canadian railways, "but it does not have a lot of research activities specifically focused on winter operations."

While the carriers have invested a significant amount of time and money in reducing ground hazards to their operations, "they still have a significant impact on our operations when they occur," Tays explains. "If our train service is disrupted because of one, it's very hard to return to normal operations." Those disruptions are costly to clear up, both and in terms of delayed shipments and rerouted trains. There's an obvious financial benefit in reducing these interruptions.

Tays says one goal for the lab is "to develop a way to prioritize risk areas. That way we can manage ground hazards." While mountainous terrain poses the risk of slides that can close and damage tracks, in other regions the railways want to identify areas where the roadbed needs upgrading to minimize operational service disruptions.

"The lab will look at ways to manage disruptions and things we can do with our infrastructure that will make us more durable," he continues. "What are the right things for us to focus on from an operational perspective?"

The lab in Edmonton will be able to link into research in other countries and the International Heavy Haul Association, Tays adds. "We don't want to spend time reinventing the wheel."

Michael Hendry, CaRRL's associate director, says the lab already has six post-doctoral students studying at the facility and expects another 20 graduate students to do work at the facility in the next five years. "We're aiming to produce highly-qualified personnel to work in the railway industry," Hendry says.

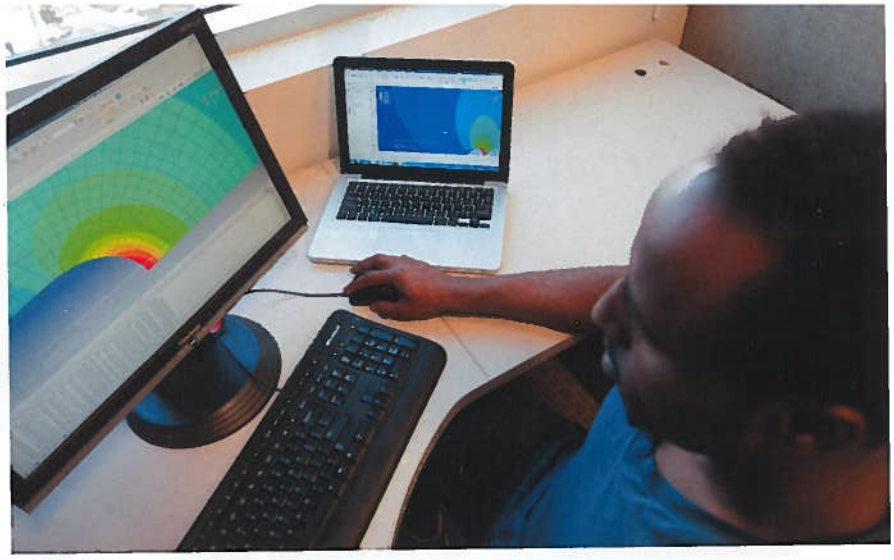
The lab's focus will be long-term engineering research on roadbed, sub-roadbed, ballast and frost heaves, which can pose safety hazards to railway operations. It will study landslides, rock falls, land subsidence, erosion, as well as snow and ice conditions.

CaRRL will also conduct studies into winter service reliability that include optimal materials evaluations, fuels and cold weather engineering, avalanche monitoring and control, response to service disruptions, and weather monitoring and predictions. Having the railways active in the lab's work operations will ensure the research projects address the industry's concerns, Hendry adds.

At the announcement of the lab's formal launch, federal Transport Minister Denis Lebel said his department's "investment will support new job opportunities and make it easier for researchers, industry and governments to work together to improve rail safety and efficiency. By developing technology, and training the next generation of students for careers in rail, this partnership will help the Canadian rail sector remain well-equipped and competitive."

Mike Roney, CP's General Manager of Technical Standards Engineering Services, said his company was "proud to join with railway partners in support of this innovative research lab which will also foster a new generation of bright young minds in our industry. CaRRL will contribute to important research and

CaRRL will also conduct studies into winter service reliability that include optimal materials evaluations, fuels and cold weather engineering, avalanche monitoring and control, response to service disruptions, and weather monitoring and predictions.



development that will provide valuable insight into improvements that can be made to railway efficiency and reliability particularly for Canada's colder winter climate."

Lowenger says the technical committee of the Railroad Research Advisory Board brings together specialists from the various sectors of the industry to consider projects for the lab. That includes both the short lines and railway equipment suppliers.

"We're an industry that needs to be more closely linked with research being conducted at the universities," he adds.

Tays says railway engineering used to be part of many university engineering curriculums. He sees the lab as a way to attract interest in railway engineering among today's students.

"Engineers who work with the lab will come to the railway industry with a lot of knowledge about how it operates," he points out. "They will know the work."

Finding new ways to boost the efficiency and safety record of the railways should generate plenty of ideas from the engineering community.

In a presentation that accompanied the formal launch of the lab, CaRRL said it will specialize in geotechnical and cold weather engineering, risk assessment and mitigation, and equipment scanning technology.

Its researchers will launch a data mining initiative that will comb the records of infrastructure and mechanical incidents spanning more than a century, decades of accumulated track geometry car measurements and data collected by the network of wayside detectors CN and CP have deployed across the country. They will be looking "for trends and correlations not previously identified, which will provide insight into problems on network scale."

Another project will look into frost heaves of track "to quantify the magnitude of the problem and determine the local causes of frost at problematic sites." Currently the railways deal with the heaves by slowing the speed of their trains. They can salt areas where heaves are a reoccurring problem.

The lab will use ground-penetrating radar to study the susceptibility of the sub-grade beneath the line to heaves and fouling of the rock ballast used to stabilize the track.

It will also research into the causes of tunnel icing during the winter, which is a hazard for trains passing through. The engineers will focus on understanding how frost penetrates into tunnels leading to the buildup of ice. The research will be conducted in CP's Mt. Shaunghnessy tunnel in the Rockies.

Another area of study will be how to remedy the composition of soft ground under the tracks that can hold up to modern heavier freight trains.

The purpose of this research project is to map the extent, variability and impact of very soft sub-grades on the track components and the amount of maintenance. It will use a new technology developed at the University of Nebraska to measure track deflection from a moving rail car.

The lab also plans to focus on the development of the technological and analytical capabilities to map the extent, degree and effect of fouled ballast.

Degraded ballast can impair the stability of the tracks and lead to higher maintenance costs for the railways. The lab hopes to find short-term solutions to the problem while developing "a means of monitoring ballast quality on network scale, to allow for informed planning of ballast renewal to minimize overall life-cycle costs."

Cold weather rail breaks are another ongoing headache for the railways and the lab plans tests whether rail currently in use has the optimal fracture toughness at low temperatures and what kind of steel would be best.

It will also use the data from the trackside detectors to study the mechanical reliability of current airbrake designs and provide solutions. It will also be examining the link between wheel shelling and winter weather conditions that has been established by the National Research Council.

Visit www.carrl.ca for more information about the CaRRL research initiative.