

CRC for Rail Innovation

Shaping the future of rail



Industry update: Level Crossing Projects

The CRC for Rail Innovation continues to deliver the single largest research program in the history of Australian Rail. Over seven years, \$100M will be used to research significant issues affecting the Rail Industry.



An Australian Government Initiative





“...Level crossing warning systems are critical to the safe operation of rail networks globally.”



Committed to industry led research for the Australasian Rail Industry

Improving safety



LEVEL CROSSING RESEARCH

remains a very significant safety issue for the Australian Rail Industry despite the reduction in level crossing incidents in recent years. Ageing and costly technology is unable to keep up with the demands placed on existing and new network infrastructure. In addition, increases in the number of new networks amplifies the situation.

To address these critical needs, the CRC has developed a set of integrated projects that will result in an increase in safety and reduction in the cost of managing level crossings in Australia and potentially, across the globe.

The CRC has worked tirelessly over the last five years to deliver outcomes and insights into the issues with Level Crossings. As a result of the CRC's programs, critical progress has been made across a number of key areas. These projects and the progress the CRC has made are summarised in the following sections.



Our projects

Affordable Level Crossings Stage 2

REF: R3.122

Level crossing warning systems are critical to the safe operation of rail networks globally. It is an issue that is high profile both with the general community and Government bodies. A key challenge is providing effective warning systems at low cost which will ensure adoption by rail networks.

The CRC for Rail Innovation has embarked on a Low Cost Level Crossing Warning Device (LCLCWD) project that could significantly reduce the cost to industry while still maintaining a high level of safety on the network. The project aims to:

- Evaluate the potential reduction in lifecycle costs of LCLCWD's over traditional devices.
- Evaluate the safety of LCLCWD's against set standards and develop an adoption model for the Australian rail industry.
- Trial the performance of LCLCWD's in parallel at three locations to determine performance over traditional devices and systems.
- Investigate human factors associated with frequent or prolonged right-side failure including cross-state simulations using CARRS-Q's¹ driving simulator.

→ Project Status

To date, significant progress has been made and a number of key milestones have been achieved. A number of level crossing suppliers have entered into an agreement with the CRC for Rail Innovation to trial LCLCWD solutions across several states in shadow mode (data collection).

A nationally consistent set of requirements and principles for LCLCWDs adoption has been developed and will be submitted to industry participants for feedback.

The risk evaluation on the safety integrity of low-exposure level crossings is near completion. This work is a key input for the RLX Intervention Framework and Low Cost RLX Risk and Legal Evaluation projects detailed on the following pages.

✓ Benefits to Industry

The results of this project will provide a basis for the development and introduction of LCLCWD's. This will reduce the cost of implementing and maintaining Level Crossing Warning Devices across networks, while still meeting existing safety standards.

1 | CARRS-Q = Centre for Accident Research & Road Safety - Queensland

Baseline Rail Level Crossing Video

REF: R2.119

A key to improving long-term safety at level crossings is to understand the factors that cause both accidents and near-misses.

Data on near-misses has previously not been consistently and centrally located. It has therefore not been possible to develop a holistic cause and effect model to reduce near-miss occurrences.

The purpose of this project is to address these issues and provide a framework for collecting and analysing data for the future. The project aims to:

- Create a system that collects relevant data on near-misses at crossings that will form the basis for the causation for near misses. Data sources include but are not limited to; cab video, cab GPS, ATP logs, signalling logs, and geo referencing.
- Use data to develop and refine a near-miss causation model. The final model will provide a clear and objective model for evaluating near-misses and improving safety at level crossings.
- Reduce the subjectivity of near-miss incident reporting through the use of a sophisticated model and provide consistent and accurate data for evaluation.

→ Project Status

The near-miss causation model is currently in development and the first version will be available late 2012. The input for the model has been provided through workshops with a number of industry experts. Design of the data capture and analysis system has commenced and is expected to be completed on schedule.

✓ Benefits to Industry

Implementation of a predictive model will improve capacity to prevent near-misses and accidents at level crossings as well. This will improve the safety of the networks and reduce the cost associated with accidents at level crossings.

Intelligent Transport Systems (ITS) for Safer Level Crossings

REF: R2.111

Research has shown that road vehicle drivers are complacent as well as lacking knowledge when it comes to complying with both active and passive rail crossing warning systems.

This project aims to improve level crossing safety by examining road vehicle drivers' responses to new ITS. These systems include in-vehicle, and road-side warning and protection systems. The project aims to:

- Evaluate and trial ITS in-vehicle devices to determine the most effective warning system technology. Using a driver simulator, assess road vehicle driver response to a range of in-vehicle assistance systems to warn of approaching Railway Level Crossing (RLX).
- Evaluate the resulting behavioural changes and safety impacts of different assistive systems (human errors, intentional actions, objective and subjective risk assessments) in different traffic situations.
- Provide a set of recommendations to industry on strategies to improve safety with ITS at Rail Level Crossings.

→ Project Status

The three most promising ITS for safer level crossings have been selected through a cost-benefit analysis process. Human Machine Interfaces (HMI) have been designed for the three ITS devices taking into account human factors and preferences of a panel of Queensland drivers.

A finalised design and methodology for the CARRS-Q driving simulator experiment has been completed. This simulator will assess the effects of the ITS on driving performance, mental workload, user's acceptance and effects on traffic flows around Rail Level Crossings.

✓ Benefits to Industry

The introduction of integrated in-vehicle (passenger and light transport) systems will potentially significantly reduce accidents at rail level crossings. The long term vision is that these devices will eventually be installed in all new vehicles.

Understanding Pedestrian Behaviour

REF: R2.120

At present, little is known about the situational and psychological factors that influence pedestrians' decision making and behaviour at level crossings. Due to the fact that pedestrians are more likely to be severely or fatally injured when struck by a train compared to vehicle drivers, it is critical that we gain a better understanding of the factors leading to these incidents. This project aims to:

- Provide an in-depth analysis of pedestrians' decision making processes that contribute to making errors as well as deliberately taking risks on railway crossings (human factors).
- Identify the groups and characteristics of pedestrians most at risk of being struck by a train e.g. school children, males, older pedestrians.
- Examine the situation factors (e.g. signage, gates, red lights) that have the greatest impact on pedestrians' decision making at crossings.
- Develop a set of recommended strategies to increase pedestrians' awareness of risks associated with railway crossings and increase compliance with rail crossing rules.

→ Project Status

Since commencing in January of this year, several key milestones have been achieved including the appointments of supporting postgraduate students.

A review of existing information to determine primary factors influencing pedestrians' decision making processes is nearing completion and a series of focus groups have been scheduled for the coming months.

✓ Benefits to Industry

The recommendations from this study will provide critical information that will enable the rail industry to more effectively develop strategies to change the behaviour of high-risk pedestrian groups. This will ultimately reduce the occurrences of pedestrian accidents at level crossings.

Rail Level Crossing Intervention Framework & Low Cost RLX Risk & Legal Evaluation

REF: R2.121

The RLX Intervention Framework project evaluates options for improving safety at level crossings by determining the optimum mix of active and/or passive counter-measures. The intervention framework project is integrated with a number of other projects to ensure a holistic model is developed. The project aims to:

- Develop a position paper outlining options for the most effective safety model per unit of capital expenditure.
- Integrate the economic and risk results of the Affordable Level Crossings Stage 2 project and a further technical evaluation which will then be reviewed by key stakeholders.
- Provide critical input into the proceeding Low Cost RLX Risk & Evaluation project.

→ Project Status

The project is on track to provide input ready for integration into the Low Cost RLX Risk & Evaluation project.

✓ Benefits to Industry

This project will provide a key decision-making framework to support LCLCWD adoption in the context of the available hierarchy of controls at level crossings and currently available tools such as ALCAM². This framework will provide the foundation for rolling out LCLCWD's across rail networks.

This model will be supported by detailed case studies to support the decision-making framework.

For more information

Visit www.railcrc.net.au for full details on Rail Level Crossing projects and a range of others covering the Australian rail industry.

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Committed to industry led research
for the Australasian Rail Industry