

## **Addressing road user behavioural changes at railway level crossings**

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### **Abstract**

In August 2006, the National Railway Level Crossing Behavioural Coordination Group (BCG) was formed as a unique national initiative. Endorsed by the Australian Transport Council (ATC), the group is comprised of senior road and rail government representatives from each state and territory and the Australasian Railway Association. With a focus on level crossing safety, the BCG oversees the development, delivery and evaluation of research and projects that aim to improve road user behaviour by implementing education, awareness, enforcement and technological initiatives. It has achieved significant success in its first two years of existence.

The full paper will explore the following BCG projects:

- In 2007, the BCG commissioned the first National Rail Level Crossing Study. Over 4400 road users participated in the survey that measured awareness, knowledge and perceptions of the rules and risks associated with level crossings.
- Also in 2007, the BCG completed the Exemplar Education and Enforcement Pilot. This was a 'before and after' study that measured road user behaviour at level crossing sites in Victoria and the Northern Territory. The Pilot was conducted to provide a basis on which to develop guidelines for effective, practical and sustainable enforcement programs and associated community education programs at level crossings for use across all jurisdictions.
- Using the findings from the Behavioural Survey and Education and Enforcement Pilot, together with awareness and education programs from overseas for baseline information, a Communications Package is being created by the BCG. Once complete, this will be available for all jurisdictions, allowing national campaign(s) to be developed and implemented that are based on reliable national and local information.

### **Keywords**

Level crossings, road users, safety initiatives, behavioural change

### **The Australian level crossing setting**

Road user crashes at level crossings are estimated to cost the Australian Government and Rail Industry in excess of AU\$100 million per year. According to the Australian Transport Safety Bureau (ATSB), on average 37 people die at railway level crossings in Australia annually. There are approximately 100 level crossings collisions each year between vehicles and trains. Of these, about 60 percent are pedestrians.

In comparison to the Australian road toll, this is minor BUT with the potential for a collision to be catastrophic in terms of loss of life and economic impact, level crossing collisions are the Australian rail industry's number one priority. This is exemplified by two recent collisions – one in 2006 at Lismore in Victoria between a freight train and a truck which resulted in over

\$20m damages and a collision in 2007 between a truck and passenger train at Kerang also in Victoria that resulted in the loss of 11 lives and 20 significant injuries.

In 2002 for the Seventh International Symposium on Railroad - Highway Grade Crossing Research and Safety, a national stocktake was conducted to identify the number of level crossings in Australia. With collaborations from rail regulators and accreditation authorities, the approximate figure of 9400 has since been employed to numerically represent Australian level crossings. However, this number does not include pedestrian, private, occupational, sugar cane or grade separated crossings. It is therefore assumed a much greater number of level crossings are located on Australian railways. In an effort to produce a more accurate illustration of Australian level crossings and the size of the level crossing safety issue, the Australasian Railway Association (ARA) is currently collaborating with all track managers to update this data.

The national level crossing stocktake also documented the type of protection provided at each public road - rail interface. Of the 9400 public level crossings, 28% are fitted with active protection whilst the remaining sites are passively protected by Stop or Give-way signs. Following the Kerang collision the public and members of Parliament have become very vocal in calling for active protection namely lights, booms and bells at all level crossings. However, an ATSB study that examined 87 fatal level crossing collisions between 1988 and 1998 found that 51% of Australian level crossing accidents occur at actively protected sites. This decade-spanning study emphasises the fact that infrastructure alone is not the answer to increased road user safety at level crossings. Instead, the ARA believes a combination of education (aimed at changing road user behaviour), enforcement and engineering measures will lead to safer level crossings in Australia.

Australia is run by a federal Government system. Under this approach, the management of level crossing safety is divided between individual jurisdictions. The country consists of six states and two territories. Each jurisdiction has a Level Crossing Safety Steering Committee that manages level crossing safety initiatives in their respective areas. Today, cooperation exists between road and rail stakeholders. However, historically, rail and road authorities from each jurisdiction worked independently to increase safety at level crossings. The following factors are attributed to this divided past:

- Level crossing fatalities are a only a small portion of the national road toll but contribute to the majority of the rail toll
- The size of the Australian level crossing safety issue is artificially split in two as rail fatalities at level crossings are included in the rail toll while motor vehicle and pedestrian fatalities at level crossings are totalled in the road toll. This method of reporting unfortunately diminishes the level crossing safety issue in Australia making it more difficult for the rail industry to highlight and communicate the size of the issue to governing bodies.
- Ambiguity existed across the Australian road and rail industry in terms of who was responsible for level crossings. This was due to the fact that the only section of the road system road authorities were not responsible for was level crossings. Road and infrastructure maintenance at level crossings was the rail stakeholder's responsibility however in some jurisdictions, this responsibility was unclear. To address this, the Australian Government recently introduced Interface Coordination Agreements

(ICA's). The new legislation will be explored further in this paper however, it should be noted that ICA's now ensure road and rail authorities collaborate in their level crossing responsibilities and safety measures.

### **Changing trends**

The ATSB recently conducted an investigation into 12 level crossing crashes between motor vehicles and trains that occurred in Australia between April 2006 and December 2007. The Government review and accompanying Safety Bulletin was initiated in an effort to publicly highlight Australia's level crossing issue. A total of 19 lives were lost with 60 people injured in the 12 collisions examined. In almost every incident, it was found the vehicle driver failed to comply with traffic control measures. Fatigue, complacency, sighting problems, distraction and the expectation not to encounter a train were identified as underlying factors contributing to motorist's failure to stop and give-way to trains. Noting a train driver's inability to minimise or avoid collisions due to train operational limitations, the study highlighted the need for other level crossing safety measures, notably behavioural programs rather than solely relying on level crossing safety infrastructure.

The level crossing Safety Bulletin was produced in conjunction with the Australian Trucking Association and the ARA. It identified an increasing trend of heavy vehicle (truck) level crossing accidents and a consequently heightened fatality risk and death toll. Nine of the 12 accidents investigated involved heavy vehicles. This trend represents Australia's growing freight industry. Trucks hauling three trailers were approved for rural regions of Australia in 2007 as part of the B-Triple Network . The ARA has been very vocal in its dispute of the Government endorsing B-Triple trucks however to date, this has fallen on deaf ears. These trucks measure up to 53.5 meters in length and can take up to 71 seconds to clear a level crossing from a complete stop. Most level crossings located on the B-Triple network have not been appropriately assessed for such vehicles and thus, the Government's decision is not only increasing risk at rural level crossing but contributing to the rising trend of heavy vehicle collisions at these sites. Work is underway to re-assess the sight distance required in these circumstances.

### **The National Railway Level Crossing Behavioural Coordination Group (BCG)**

In response to major level crossing collisions across Australia and growing recognition of the difficulty of the issue, in 2003, the Australian Transport Council of Ministers (ATC) approved the National Railway Level Crossing Safety Strategy. This Strategy aims to address the complex road user, pedestrian and train interface safety issues at Australian level crossings. The strategy's objective is to reduce the number, cost and trauma of crashes between trains and any road user in the most cost-effective means. To implement this strategy and its accompanying action plan on a national scale, the ATC formed the Australian Railway Crossing Strategy Implementation Group (ARCSIG). Composed of road and rail authorities, Government members and the ARA, the ARCSIG's brief encompasses railway level crossing safety, rail infrastructure and level crossing policy.

As a member of the ARCSIG, the ARA was tasked with implementing behavioural initiatives to increase safety at level crossings. To improve the execution of these behavioural programs, the ARA in conjunction with senior Government representatives proposed the creation of the National Railway Level Crossing Behavioural Coordination Group (BCG). Endorsed by

senior Government road and rail authorities, the ATC approved the proposal for the national group in June 2006 for a two year period.

Made up of senior road safety and rail safety representatives from each state and territory, the BCG represents a first within Australian transport as Government road and rail senior managers from all jurisdictions work together with the rail industry towards a coordinated national approach to improving road user behaviour at level crossings. The BCG oversees the development, delivery and evaluation of research and projects that aim to improve road user behaviour by implementing education, awareness, enforcement and technological initiatives. The group carries out its projects within a budget of \$400K per annum. Of this budget, \$120K was contributed in-kind by the rail industry whilst each jurisdiction contributed amounts proportionate to their population.

The BCG partnership initiated a meaningful dialogue between industry and the Australian Government and has seen a high level of cooperation and collaboration between road and rail on the level crossing safety issue. This publicly highlighted the topic and built confidence within the Australian Government and public that the rail industry is serious about increasing safety and decreasing level crossing accidents. Before the BCG, jurisdictions and industries worked individually but now, resources, funding and initiatives from across Australia are pooled as the group effectively and efficiently works together towards level crossing safety. The collaborative development of behavioural programs between jurisdictions produces nationally conducted projects at a fraction of the cost of undertaking these projects in each jurisdiction. Furthermore, some jurisdictions are able to benefit when they would otherwise have not had sufficient funds.

The BCG has been highly successful in the Australian level crossing environment. It has implemented a number of behavioural initiatives that are the first of its kind within the country. Key deliverables of the group are a national level crossing survey, an education and enforcement pilot, a website, an inventory, a communications package and a national workshop. These are detailed in the following.

## **1. National Rail Level Crossing Road User Behavioural Study**

In 2007, the BCG commissioned the first National Rail Level Crossing Road User Behavioural Study across all jurisdictions. Three focus groups and 25 in-depth interviews were followed by a quantitative survey of over 4400 road users across Australia. The study identified self-reported behaviours and attitudes to measure participant's awareness, knowledge and perceptions of the rules and risks associated with level crossings. It also measured how respondents view and interact with railway level crossings.

Participants were road users aged 18 years and older in possession of a current driving licence who had travelled over a level crossing at least once within the past six months (exclusive of being a passenger). The study intentionally over-represented regional and rural Australians in an effort to mirror the prevalence and location of Australian level crossings that are predominantly found in rural and regional Australia.

Some of the key survey takeouts follow:

- 24% reported engaging in illegal usage of a level crossing one or more times. This included crossing when a train was visibly approaching, not stopping at a stop sign,

accelerating to pass under a lowering boom gate, not waiting for the lights and boom gates to cease operation before proceeding across train tracks, avoiding the boom gate by driving around it and becoming trapped between lowered boom gates in their effort to rush across a level crossing.

- Approximately one in five acknowledged they had travelled over a level crossing and not realised until after they had crossed
- One in five were not aware of any penalties for breaking the rules at level crossings while 66% believed they were less likely to be penalised for breaking rules at level crossings than driving at speeds exceeding the speed limit
- Driver inattentiveness and impatience were collectively identified as the greatest factors contributing to increased risk at level crossings
- One in four reported engaging in risky behaviour at level crossings yet not all participants classified crossing when a train is approaching as risky
- 16 – 25 year old drivers were identified as the group most at risk at level crossings. Interestingly, this group was self-aware of their heightened risk yet older drivers were less aware of their own risk.

The findings from this innovative national survey are available to each jurisdiction and are now being utilised in conjunction with the education and enforcement pilot (detailed below) to tailor a national communications package.

## **2. Exemplar Education and Enforcement Pilot**

Also in 2007, the BCG conducted the Exemplar Education and Enforcement Pilot. A ‘before and after’ study, the program measured road user behaviour at level crossing sites in metropolitan and rural Victoria and examined the results of a mining company’s level crossing initiatives in the Northern Territory. Behaviour at the nominated level crossings sites was monitored to measure compliance with stop and give-way signs as well as crossings fitted with lights only and those fitted with lights and booms. A local education campaign and accompanied enforcement was then conducted in these areas for four weeks. Following this month long period, behaviour was remeasured at the test sites and control sites situated in others parts of Victoria to determine the effectiveness of the education and enforcement programs.

The pilot program was conducted to provide a basis on which to develop guidelines for effective, practical and sustainable enforcement programs as well as an associated community education program for implementation at level crossings across all jurisdictions. The aim of the pilot was to provide a basis on which to develop guidance materials for rail organisations to engage enforcement agencies in level crossing safety. It also aspired to create resources to guide rail organisations to engage with their local road safety agencies to conduct community awareness campaigns.

This study recognises the fact that increased compliance with road rules at level crossings will decrease the number of level crossing collisions and that enforcement is a critical element of heightened level crossing safety.

The ARA participated in the program with the Public Transport Safety Victoria (project manager) and VicRoads. Three Community Road Safety Councils delivered local education campaigns whilst Victoria Police conducted enforcement at the sites. The pilot demonstrated that enforcement has a positive effect on road user compliance with Stop signs at level crossings.

A mining company's compliance program in the Northern Territory was examined as a case study. After unsuccessfully stationing a security guard at a level crossing to enforce stopping at the Stop sign, the company introduced a log book that drivers had to exit their trucks to sign before they travelled over the crossing. The book remained for four months before being removed and replaced intermittently with security. Over three months of monitoring, non-compliance was almost eliminated and remained very low over the following five months with only the occasional heavy vehicle failing to comply (the most recent information available).

As the sample size of the Victorian pilot was relatively small, it is believed this project will be used as preliminary work. However, it does suggest very low levels of compliance at crossings and the potential benefits of controlled education and enforcement to improve safety. Findings from the project will be incorporated into the communication package to ensure the resource is an effective tool for educating the public and communicating the level crossing safety message.

### **3. Inventory**

The BCG is compiling an inventory of Australian and overseas level crossing behavioural programs. Details of targeted safety education programs, mass media campaigns, enforcement programs and community awareness campaigns are being collected and put into a specific location on the ARA website. The inventory will be updated regularly and will act as an information and reference source for those interested in level crossing initiatives that have been conducted in Australia or overseas.

The inventory will also provide points of contacts for further information regarding specific campaigns or programs and Australian level crossing statistics.

### **4. Website**

Level crossing safety web pages containing relevant information on level crossings and safety behavioural initiatives are located on the ARA website. These pages are continually updated with key deliverables of the BCG and other ARA level crossing projects. Links to useful Australian and overseas level crossing websites is also provided.

### **5. National Workshop**

On 21 February 2008, the BCG in collaboration with the ARA held the "*Safer Road User Behaviour at Level Crossings – A National Workshop*". The National Workshop presented key initiatives completed to date by the BCG and provided an environment for stakeholders to discuss future level crossing safety options. During the Workshop, attendees formed groups and participated in an interactive session brainstorming ideas and future BCG projects to

reduce level crossing collisions and injuries as well as safety initiatives that could be implemented by groups outside the BCG.

Senior representatives from Commonwealth and State Government authorities, the rail and trucking industry, rail regulators and investigators, unions, enforcement agencies and the Victoria State Coroner's Office participated in the workshop which was labelled a success by the ARA, BCG and attendees.

## **6. Communications Package**

A Communications Package is being created by the BCG using the findings from the National Rail Level Crossing Study, Exemplar Education and Enforcement Pilot, and awareness and education programs from overseas, as baseline information. The communication package will consist of a resource kit that will include a radio advertisement and four press advertisements. These will be available to all jurisdictions to provide nationally consistent communication materials for future level crossing safety communication campaigns undertaken by Government and industry.

Whilst users will be required to fund the distribution of the communication materials, the availability of such resources will save time and money whilst providing effective communication tools that are easily and quickly obtainable. The creation of this package will help distribute consistent and effective safety messages to the appropriate target groups as identified within the national survey and education and enforcement pilot.

## **7. The future of the BCG**

It is proposed the BCG will continue with a focus on examining how infrastructure influences road user behaviour at RLXs.

### **Rail Industry Level Crossing Strategy**

In 2007, the ARA developed a National Strategic Plan identifying seven objectives for Industry. Objective five aims "to bring about the introduction of measures that substantially reduces level crossing collisions". To achieve the anticipated outcome of reduced level crossing fatalities, injuries and associated costs, the Industry Level Crossing Strategy was produced.

The strategy recognises that level crossing crashes are a low priority issue for road authorities and acknowledges the need for the rail industry to lead the way in level crossing safety initiatives. The main focus of the 2008/09 action plan is education, enforcement and engineering initiatives. These actions will incorporate a wide range of measures whereby industry will work with Government and other stakeholders to reduce level crossing fatalities and injuries.

## **Conclusion**

The BCG has been extremely successful at implementing an array of research projects and initiatives to increase level crossing safety. It has demonstrated how jurisdictional Governments have been able to work very effectively with Industry to produce cost-effective behavioural outcomes.

Clearly there is much to do in this area and it is hoped the next instalment of the BCG is granted Government approval. The BCG has brought jurisdictions together, pooling their funding and resources so Australia works towards safer level crossings as a nation rather than separate entities. The Australian rail industry believes every level crossing fatality can be avoided and is working in collaboration with the BCG and other level crossing initiatives such as the rail industry level crossing strategy to achieve zero deaths at level crossings.