



# The Australian National Railway Level Crossing Safety Strategy

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## 1. INTRODUCTION

Government agencies and rail companies have been contributing to improving railway level crossing safety across Australia for many years. Despite continuing countermeasures, many crashes continued to occur at crossings. Numerous diverse initiatives were being pursued, but there has been little co-ordination of these efforts, or assurance that the improvements would continue to achieve the desired improvements to safety. The potential for a major disaster at a railway level crossing also remained. Consequently the Australian Transport Council (ATC) directed the development of a framework for railway level crossing safety.

This paper reports the development of the National Railway Level Crossing Safety Strategy (ATC, 2003) and summarises its content, including the Action Plan for individual actions across Australia. The report summarises the major issues, provides a contextual framework and identifies the strategic directions to improve rail and pedestrian crossing safety. The availability and consequences of the crash data was a particular issue which made development of the Strategy difficult and was identified to be resolved.

The national Strategy represents a commitment by State, Territory and Commonwealth Governments to improving railway level crossing safety over the next few years. A key component in development of the Strategy was the contributions of the wide range of stakeholders. The range of different responses are summarised and discussed. The reasons why some issues and actions were included or excluded from the Strategy are discussed. Current progress on implementation of the Action Plan to implement the Strategy is provided.

## 2. STRATEGY DEVELOPMENT PROCESS

There are many stakeholders involved in railway level crossing safety including:

- government agencies for track ownership, train operation, safety regulation and policy;
- private track owners and operators;
- road owners (government and private); and
- road users (including motor vehicle drivers/riders, pedestrians, cyclists and other vulnerable road users<sup>1</sup>).

These stakeholders interact in a variety of situations including formal committees, regulatory frameworks and unofficial arrangements. These occur in different

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<sup>1</sup> The term 'vulnerable road user' is used to summarise a wide range of road users including people with disabilities, seniors, children and others likely to sustain more severe consequences of crashes than occupants of motor vehicles. This group can include motor cyclists, pedal cyclists, pedestrians, people in wheelchairs, people using motorised mobility aids, people in or pushing prams and others.

situations across Australia. Consequently railway level crossing safety is a complex issue to manage administratively.

There has been continuing concern for many years about rail crossing crashes, but there was no comprehensive co-ordinated approach to improving safety nationally. Crashes at level crossings had not been included in any road safety strategy because of their low frequency and general road safety initiatives also addressed many crossing crash issues.

Recent crashes in Western Australia, New South Wales and South Australia provided increased incentive to develop a comprehensive national approach to improving level crossing safety. In August 2002, ATC requested the Rail Group of the Standing Committee on Transport (SCOT) to develop "a strategic approach to managing the full range of level crossing issues, including; consideration of the best ways of making level crossings safer, providing appropriate disabled access and involving consultation with the rail industry."

A Working Group of Rail Group was formed which followed the following process to develop the National Railway Level Crossing Safety Strategy, which includes an Action Plan for implementation:

- investigate available information and identify the safety issues;
- identify and assess the most important activities which would contribute to improved safety;
- prepare a draft strategy to summarise the background, issues, principles and strategic directions;
- draft a list of actions which would meet the strategic directions;
- distribute the draft strategy and actions to stakeholders for comment;
- review and refine the draft strategy and actions; and
- submit the draft Strategy and Action Plan to Rail Group, SCOT and ATC for approval.

At its meeting in May 2003, the ATC approved the Strategy, noting that the Action Plan is subject to further development under the auspices of Rail Group.

### **3. SCOPE AND OBJECTIVES**

The National Railway Level Crossing Safety Strategy covers :

- crossings in metropolitan, rural and remote areas;
- crossings for all road users including pedestrians, vehicles and people with disabilities;
- all types of crossing control including active, passive and grade separation;
- all types of railway including passenger, freight, tourist, mining, heritage, and sugar/cane, but excluding light rail;
- government and private railways;
- public, private and occupational crossings; and
- any possible safety treatments and countermeasures which could result in cost effective safety improvements.

Road users include car drivers, truck drivers, motorcyclists, cyclists, all types of pedestrians Crashes within station precincts, at non-crossing locations, involving illegal trespassers, suicides and those within freight terminals are not included.

The Strategy was developed within the wider context of other strategies and other initiatives.

The objective of the Strategy was defined to be:

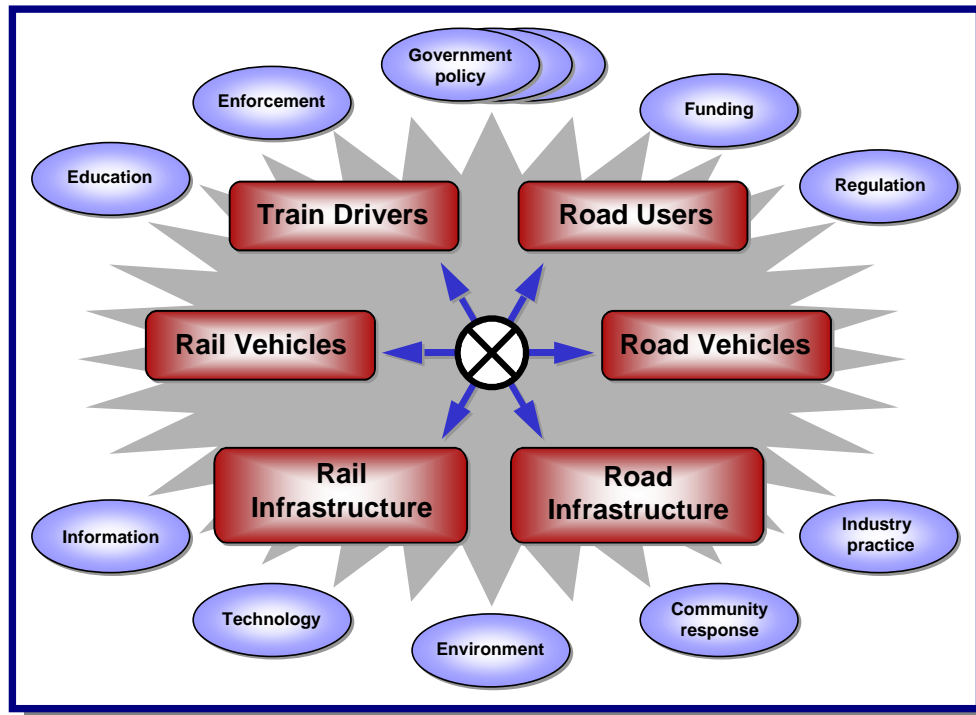
**To reduce the number, cost and trauma of crashes between trains and any road users by the most cost-effective means.**

#### 4. CRASH BACKGROUND

Of all the types of road crashes which occur, those between a motor vehicle and a train are amongst the most severe. Although relatively rare, rail crashes attract a lot of publicity because people's expectations are high (as they are for the air transport industry) and they potentially jeopardise the lives of a large number of people.

There is a wide variety of elements which contribute to crashes occurring at crossings. The following diagram illustrates the complexity of factors relevant to railway level crossing safety.

**Railway Level Crossing Context**



There are approximately 100 crashes<sup>2</sup> between a road vehicle and a train in Australia each year, and about 8% of these result in deaths (Ford and Matthews, 2002). About 22 pedestrians die each year at crossings. However fatalities at railway level crossings are only a very small proportion of the deaths that occur on roads each year.

Railway level crossing crashes have been estimated at \$180,000 per crash in urban areas and \$430,000 in rural areas (ARRB Transport Research, 2002a). Due to lack of information, this excludes the costs to the rail track owner for track and train repair

<sup>2</sup> Many statistics noted throughout this paper are approximate due to the lack of or poor quality of available information.

and for train operations, which can often amount to several million dollars for a single crash. Crashes result in substantial direct financial costs in terms of:

- medical and repair costs;
- loss of personal income; and
- loss of business and consequential financial loss.

Railway level crossing crashes result in incalculable pain and suffering for families and others associated with victims as well as any rail operator staff involved in the crash.

There are approximately 9,400 public railway level crossings in Australia, of which about 2,650 (30% ) have active<sup>3</sup> protection, 6,060 have passive protection and the remainder have other control or no protection (Ford and Matthews, 2002). There are numerous additional private, occupational and cane railway level crossings. The number of pedestrian crossings are not known. There are approximately 2,400 locomotives in service in Australia (ARRB Transport Research, 2002b).

Governments, the rail industry and others have been active in improving railway level crossing safety for many years. These efforts, which will continue have resulted in a decline in crossing crashes and severity, but this Strategy generally targets new and additional actions.

## 5. CRASH INFORMATION

### CRASH CAUSES AND SITUATIONS

Pedestrians are the predominant victims of railway level crossing fatal crashes, followed by occupants of motor vehicles, as shown in the following table (ATSB, 2002a). However a major crash involving a bus or a passenger train could result in considerable loss of life and dramatically alter recent statistics. Increasing transport demand and recent trends in vehicle design (such as cabin quietness) make it more difficult to reduce the actual number and total effects of crossing crashes.

#### Victims of Fatal Vehicle Crashes at Railway Level Crossings (1997- 2000)

Victim	Number	Percentage
Pedestrians	87	63.0%
Cyclists	0	0%
Motor cyclists	7	5.1%
Car Occupants	39	28.3%
Truck Occupants	2	1.4%
Bus Occupants	0	0%
Train Occupants	2	1.4%
Others	1	0.7%
Total	138	100%

While certain factors are identifiable, there are no predominant causes of railway level crossing crashes and generally several factors contribute to a particular incident. Alcohol, excessive speed and fatigue are identified factors, as shown in the

<sup>3</sup> 'Active' railway level crossings have signals and/or boom gates which operate automatically when a train is approaching. 'Passive' railway level crossings have signs and/or pavement markings.

following table, and these are generally addressed through road safety initiatives. Most crashes occur where the driver has local understanding of the railway level crossing (ATSB, 2002b).

### Major Factors in Fatal Vehicle Crashes at Railway Level Crossings

Factor	Percentage
Adverse weather or road conditions	9%
Alcohol / drugs*	30%
Fatigue*	8%
Unintended driver error*	22%
Excessive speed*	23%
Other risk taking*	5%

\* by motor vehicle driver

## PEDESTRIAN INCIDENTS

Over 60% of reported deaths at railway level crossings are pedestrians but there is a paucity of information readily available on a national or systematic basis about these crashes. Therefore it is very difficult to justify safety improvements, except on a case by case basis. This situation is even more acute for particular users including people with disabilities and cyclists.

## 6. ISSUES

There are many specific issues to be considered in railway level crossing safety including:

- poor crash data;
- potential for catastrophic crashes;
- increased risks for vulnerable road users;
- road driver behaviour, including deliberate risk taking and difficulty in judging a safe gap to cross in front of an approaching train;
- the defensive nature of the rail industry and the road safety industry which is sensitive to litigation; and
- difficulty in collecting information from ATSB, Austroads and other stakeholders.

International comparisons suggest that Australia has very good practice in some aspects of railway level crossing safety, which makes it difficult to identify actions which can improve safety.

### COST EFFECTIVENESS OF COUNTERMEASURES

Improving safety at railway level crossings is costly. The financial cost of railway level crossing crashes in Australia has been estimated at \$32M per year excluding rail operator and infrastructure losses (BTRE, 2003). There are about 100 crashes per year spread across 9,400 railway level crossing locations, so it is difficult to justify expensive treatments at all these locations, many of which have low likelihood of a crash. Even significant costs for improvements to the 2,400 locomotives would be difficult to justify. Therefore it is essential to identify and apply countermeasures which have low costs and provide the greatest benefits.

## 7. STAKEHOLDER INVOLVEMENT

A draft Strategy was developed by some of the State and Commonwealth road and rail authorities via the SCOT Rail Group Working Group. It was then distributed to over 150 individuals, agencies, companies and organisations for information and comment in order to refine the Strategy.

Part of the consultation during the Strategy formulation occurred through a national video conference which was held concurrently in 8 venues in Capital cities around Australia. An introductory presentation and questions from each venue were televised nationally. A workshop session followed at each venue for questions, comments and discussion. Reports from all venues and other submissions were summarised into a separate stakeholder consultation report. Over 100 people attended the video conference and local discussion.

The main issues raised during stakeholder consultation were:

- specific actions are required to meet the strategic directions, so the anticipated Action Plan to be developed must propose the most important projects;
- the importance of education for road users;
- the U.S. or Canadian 'Operation Lifesaver' program should be identified in the Strategy as a very appropriate scheme for improving public awareness and education, and to identify enforcement and engineering issues for resolution;
- light rail crossing safety should be addressed where it operates in a dedicated right of way;
- pedestrian crossing not at roads should be covered;
- the particular needs of people with disabilities and cyclists should be more explicit;
- the need to eliminate crossings where possible;
- uniform national practice needs to be co-ordinated and improved;
- applying best practice in engineering and innovative low cost treatments;
- the Strategy should cover occupational and private crossings;
- ensuring best possible design for people with disabilities and cyclists;
- good management of the implementation of the Strategy (ie the Action Plan).

Stakeholders also suggested principles to guide the choice of suitable actions, which were subsequently included as described above in Guiding Principles.

A particular point of interest was the term 'crash' to identify the situation, as opposed to alternative terms used in different contexts, such as accident, collision, conflict or incident. Collision is the term most often used generically for rail incidents. Crash is often preferred in road safety to avoid suggestions of chance or unavoidable occurrences, and includes actual incidents involving road users (not near misses). Consequently the term 'crash' was chosen and used consistently throughout the Strategy.

Responses indicated widespread support for and agreement with the proposed Strategy. The majority of suggestions received from stakeholders were about the Action Plan, which proposed many diverse activities. It would have been possible to propose more actions, which may also be justified, but an achievable plan was preferred over trying to do too much and failing. Some stakeholders preferred different tasks to be included, however there was insufficient evidence to be sure they were more appropriate than those included. The Action Plan also includes tasks to improve information allowing it to be further refined in future.

## 8. STRATEGIC DIRECTIONS

The strategy was finalised by incorporating guiding principles and specific actions.

### GUIDING PRINCIPLES

Several fundamental principles which underpin and guide the development of actions were identified:

- value for money;
- consideration of all issues;
- consideration of all stakeholders;
- application of any possible countermeasure;
- participation;
- co-operation;
- responsibility;
- consistency;
- integration; and
- management.

### POTENTIAL ACTIONS

A comprehensive strategy to improve national railway level crossing safety has not previously been prepared in Australia. At this stage, therefore this Strategy focuses more on improving information rather than treatments at crossings. Based on the information available and the issues identified, improvements to railway level crossing safety are most likely to be achieved through the following measures:

- development and application of low cost active and passive countermeasures;
- nationally consistent identification and treatment of hazardous sites;
- identification and analysis of crash causes and factors;
- improved national data and associated information on crashes and risks;
- improved information about rail industry crash costs;
- improved information about crashes involving people with disabilities and other vulnerable road users;
- improved level crossing designs for pedestrians, people with disabilities and other vulnerable road users;
- improved road driver understanding and behaviour through improved training, information, education and awareness;
- ensuring legislation and enforcement are appropriate for the potential consequences;
- identification of vehicle performance parameters and railway level crossing protection timings;
- designing railway level crossings to suit the performance of road vehicles (especially heavy vehicles), and consistent application throughout Australia; and
- additional funds for railway level crossing treatments and closures.

There are two issues currently outside the scope of this Strategy identified as requiring further consideration elsewhere:

- safety for light rail, especially at crossings; and
- trespassers in railway corridors, sometimes considered as pedestrians.

## 9. STRATEGY OVERVIEW

The strategies to improve railway level crossing safety are summarised in the following table.

**National Railway Level Crossing Safety Strategy Summary**

<b>Target Issue</b>	<b>Strategy</b>
Train Conspicuity	Ensure that road users can see either an approaching train (locomotive or carriages), or a train that is already on the railway level crossing.
Car and Truck Driver Responses	Ensure that drivers identify railway level crossing sites, and respond appropriately.
Pedestrian Responses	Ensure that pedestrians identify railway level crossing sites, and respond appropriately. Ensure that people with disabilities are provided with appropriate information by way of site design and other initiatives.
Site Assessment, Prioritisation and Treatment	Ensure that railway level crossing sites, including pedestrian crossings separate to road crossings, are designed and constructed to an appropriate standard. Develop appropriate Australian design standards for railway level crossing protection equipment including the operation and timing of flashing lights, boom barriers, pedestrian signals and gates, and active advance warning signs. Develop uniform criteria for the establishment of the level of protection for road vehicle and pedestrian crossings. Ensure that designs are appropriate for people with disabilities and other vulnerable road users. Close level crossings where appropriate. Investigate low cost treatments including active warning signs, beacons, strobe lights and other alerting devices at railway level crossings.
Stakeholder Education and Information	Develop awareness and understanding through participation amongst the public, engineers, the police and others to improve responses, engineering and enforcement.
Data Collection	Enable effective national data comparisons.
Funding	Seek additional funds for railway level crossing safety. Allocate funds for railway level crossing treatments within the context of broader transport infrastructure priorities.
Rail Industry Involvement	Industry involvement in engineering, education and enforcement programs. Ensure appropriate train standards and operation.
Legislation, Regulation and Enforcement	Ensure that laws and penalties are clear, understood, appropriate and enforced.
Coordination	Develop consistency in information, assessments, standards and practices between States. Implementation of the Strategy should be well managed, co-ordinated, monitored and reviewed.



## 10. IMPLEMENTATION

Implementation projects for the Strategy were identified through the Action Plan which includes project proposals with estimated costs, timing and responsibilities. Each project then needs to be further scoped, funded and managed by the various government agencies and other organisations identified to undertake the activities.

SCOT Rail Group established a multimodal sub-group to oversee implementation of the Strategy. The committee has diverse representation including most states and representatives from Austroads, the rail industry, rail safety regulators, railway level crossing committees, and others. This sub-group will manage, monitor and review the program to ensure the outcomes are achieved.

The terms of reference include:

- finalising projects scope, funding and authorisations;
- managing consultation and negotiation and reporting;
- further development and consultation on the action plan; and
- development of funding proposals.

Some activities currently include:

- a video camera study of vehicle distances and near-miss incidents to monitor driver and pedestrian behaviour;
- a study to gauge the nature and extent of vehicles entering crossings when the red lights are flashing and then promote the trial and use of devices to monitor crossing infringements nationally;
- development of education, information and awareness campaigns integrated with other road safety campaigns, including possible adoption of "operation lifesaver".
- investigation of causes of train crashes with pedestrians, including those with disabilities, and consider safety treatments.
- a trial of a low-cost active warning devices;
- development of Austroads Part 16 – Guide to Traffic Engineering Practice for Railway Level Crossing Protection (for both active and passive type crossings and for both vehicle and pedestrian crossings);
- development of an Australian standard risk score system for prioritising treatments at railway level crossings; and
- finalising Australian Design Standards for nationally consistent warning time intervals for active protection mechanisms at level crossings.

## 11. CONCLUSIONS

The Australian National Railway Level Crossing Safety Strategy was developed for the Australian Transport Council over a relatively short period of time. It consolidates a group of actions amalgamated from a background of divergent views, interests and activities. Nevertheless the Strategy is widely accepted as identifying appropriate direction and actions to improve railway level crossing safety across Australia. The Action Plan incorporated in the Strategy is now being implemented with co-operation from all major interests.

## 12. REFERENCES

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