

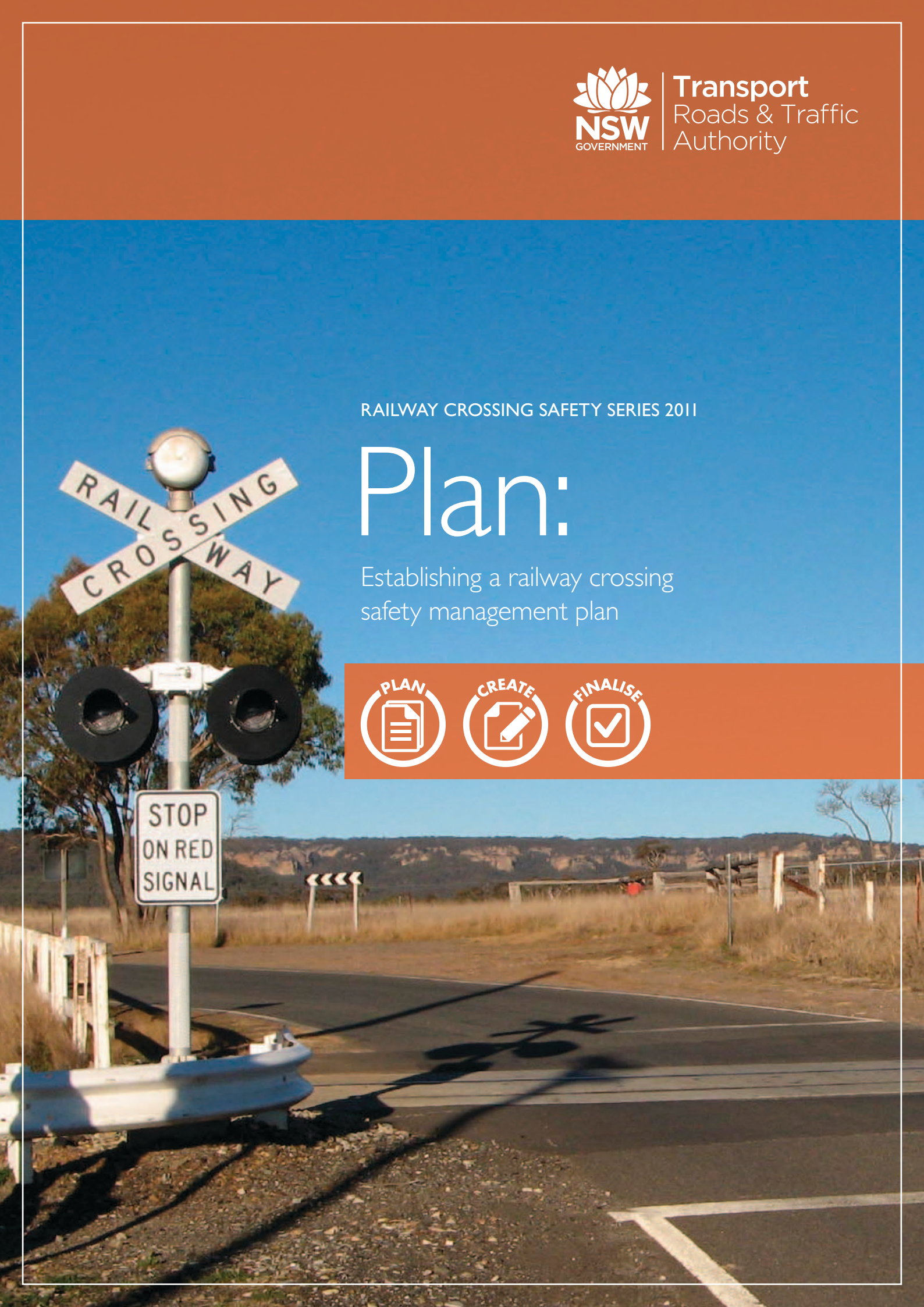


Transport
Roads & Traffic
Authority

RAILWAY CROSSING SAFETY SERIES 2011

Plan:

Establishing a railway crossing
safety management plan



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Section 1

Introduction

Railway crossings (RCs) are an integral part of the State road network. However, their existence and operation present a risk to the safety of road users within New South Wales. Although the number of crashes at RCs is relatively low, the potential for fatalities and serious injuries to road users as a consequence of a crash is high. When this potential is combined with the extended delays to the operation of the road and rail networks caused by crashes at an RC, the importance of the planning and management of safety risks at RCs is clear.

In recognition of the safety risks present at RCs, the RTA has included this infrastructure type within its overall safety risk framework.

A number of roads authorities, including the RTA, and rail infrastructure managers are responsible for the management of the various infrastructure components associated with an RC.

The requirement for RC interface agreements between the roads authority and rail infrastructure managers was mandated when the *NSW Rail Safety Act 2008* came into force in January 2009. A safety management plan must be developed for each RC identified in an interface agreement. These plans are an integral part of the interface agreement, and set out the risks identified at an RC, the measures taken to manage those risks and the responsibilities for the management of those risks.

An RC can consist of both public and private rail lines and public and private roads, and exists where roads and rail lines cross at the same grade. RCs are spread throughout New South Wales on State, regional and local roads.

The RTA manages RCs with the aim of improving safety for road and rail users, maintaining the efficiency of the State road network, and complying with legislative requirements.

Plan: Establishing a railway crossing safety management plan has been developed to guide RTA practice in the creation of railway crossing safety management plans and the ongoing management of safety risks and safety management measures.

1.1 Purpose

This guideline provides planners and project managers (referred to as planners from this point forward) with the process, procedures and tools to meet the RTA's legislative, occupational health and safety, project management and other requirements for the planning and management of safety risks, RC safety management measures and RC safety management plans.

The planning and management of safety risks, safety management measures and RC safety management plans requires a systematic planning approach, involving collaboration with both internal and external stakeholders. Such an approach ensures that safety outcomes at RCs are maximised.

In regards to these points, this guideline assists planners to:

- **Understand** and **assess** the safety risks, hazards and hazardous events at an RC, particularly those that fall under the responsibility of the RTA.
- **Identify** road and traffic management infrastructure assets that are under the control of the RTA at an RC.
- **Evaluate** existing safety management measures at an RC and assess the need for additional safety management, so far as is reasonably practicable.
- **Develop** an RC safety management plan. This plan will support RTA objectives, policy and legal requirements, and document the ongoing management practices of RTA infrastructure assets and systems that manage safety risks.
- **Administer, monitor** and **report** on RC safety management plans to ensure that they comply with legislative and business requirements.

1.2 Background

1.2.1 The legal status of interface agreements

The NSW *Rail Safety Act 2008* (the Act) commenced on 1 January 2009. This Act covers the planning and management of interface agreements. The Independent Transport Safety Regulator (ITSR) is the body responsible for the implementation of the Act.

The Act requires all responsible parties to enter into a written agreement covering the management of safety risks at RCs. In relation to this agreement, Part 2, Division 3, Section 29 of the Act introduced new statutory provisions requiring rail infrastructure managers and roads authorities for a public road to:

- **Identify and assess**, so far as is reasonably practicable, risks to safety that may arise from the existence of, or use of, any RC that is part of the road.
- **Identify and assess**, so far as is reasonably practicable, risks to safety that may arise from the existence of roadworks being carried out on either the whole road or part of the road. This includes situations where these roadworks arise wholly or partly because of railway operations carried out on, or in relation to, any rail infrastructure.
- **Determine** measures to manage, so far as is reasonably practicable, the above-mentioned risks, including the evaluation, testing and, if appropriate, revision of the measures which are adopted.
- **Identify** the respective roles and responsibilities of each party to the agreement in relation to the above-mentioned measures.
- **Seek** to enter into a written agreement with the rail infrastructure manager regarding the management of safety risks that have been identified and assessed.
- **Document** the procedures by which each party to the agreement will monitor their compliance with their obligations as specified in the agreement.
- **Implement** a process for reviewing and revising the agreement.

Once an agreement has been signed, the parties to the agreement have entered into a contractual relationship and are bound by the terms and conditions of the agreement.

The Act does not interfere with the *Civil Liability Act 2002* and the benefit of the protections offered by the *Civil Liability Act* to public authorities, including the Section 45 protection relating to roads authorities. Section 45 provides that a public roads authority is not liable to proceedings for civil liability for harm arising from a failure of that roads authority to carry out road work, or to consider carrying out road work, unless at the time of the alleged failure the roads authority had actual knowledge of the particular risk, the materialisation of which resulted in the harm.

Where a rail infrastructure manager or roads authority unreasonably refuses or fails to enter into an agreement with another person, as required under Part 2, Division 3 of the Act, or is unreasonably delaying the negotiation of an agreement, the ITSR may appoint an independent person to determine the arrangements regarding the agreement. In addition, this person may direct the parties to give effect to the specified arrangements. Compliance with any such direction is mandatory.

Applications for a person to be appointed under Section 30 of the Act may be made by a rail infrastructure manager or a roads authority, and should be made in writing to the ITSR.

Under Section 33 of the Act all relevant parties are obliged to maintain a register of the agreements into which they have entered. In addition, all relevant parties are obliged to maintain a register of any arrangements determined by a person appointed under Section 32 of the Act.

1.2.2 Planning based on the 'so far as is reasonably practicable' legal standard

The legal standard for identifying, assessing and determining measures to manage the safety risks related to a railway crossing is 'so far as is reasonably practicable' (SFAIRP).

Section 6 of the NSW *Rail Safety Act 2008* provides guidance on what is meant by 'so far as is reasonably practicable' in the context of ensuring safety, and is detailed below.

NSW Rail Safety Act 2008 No 97 – (quoted September 2010):

6 The concept of ensuring safety

- (1) A duty imposed under this Act or the regulations to ensure, so far as is reasonably practicable, safety requires the person:
 - (a) to eliminate risks to safety so far as is reasonably practicable, and
 - (b) if it is not reasonably practicable to eliminate risks to safety, to reduce those risks so far as is reasonably practicable.
- (2) For the purposes of this Act or the regulations, regard must be given to the following matters in determining what is (or was at a particular time) reasonably practicable in relation to ensuring safety:
 - (a) The likelihood of the risk eventuating,
 - (b) The degree of harm that would result if the risk eventuated,
 - (c) What the person concerned knows, or ought reasonably to know, about the risk and any ways of eliminating or reducing the risk,
 - (d) The availability and suitability of ways to eliminate or reduce risk,
 - (e) The cost of reducing or eliminating the risk.

In addition, the National Transport Commission provides the following information concerning 'so far as is reasonably practicable' (SFAIRP):

SFAIRP is a legislative qualification that is well known to the law and found in a number of statutes both in Australia and overseas. In essence, it requires weighing the risk against the resources needed to eliminate or reduce the risk. It does not require every possible measure to be implemented to eliminate or reduce risk, but it places the onus on the person holding the duty to demonstrate (or be in a position to demonstrate) that the cost of additional measures to control the risk (over and above those risk controls already in place) would be grossly disproportionate to the benefit of the risk reduction associated with the implementation of the additional risk control.

Source: National Transport Commission June 2008, *National Rail Safety Guideline - Meaning of Duty So Far As Is Reasonably Practicable (SFAIRP)*, p.1.

The funding arrangements for RTA programs have necessitated the adoption of SFAIRP in road design and traffic management. The funding available is not sufficient to ensure that all design criteria and traffic management needs can be met at all times. For instance, in urban areas with buildings constructed to the property boundary, or along roads with sub-standard horizontal or vertical road geometry and with major utilities in the footway, the cost may preclude road realignment to meet standard sighting guidelines; therefore other less-costly measures may be implemented to enhance safety.

In the context of exhaustible funding, the principle of SFAIRP has been adopted by the RTA in its risk assessment of safety risks, and in the safety management measures it uses to manage safety risks at RCs. The use of SFAIRP leads, in general, to cost-effective and adequate designs, rather than designs which simply 'meet design criteria'.

The RTA will use a proactive and considered approach to managing safety risks at an RC. In particular, the RTA will use a proactive and considered approach in deciding whether safety management measures need to be taken, and in determining the extent of those measures that the RTA decides to take. All decisions regarding safety measures will consider the particular circumstances and facts of each case, while recognising that there is no absolute standard as to what constitutes a 'so far as is reasonably practicable' level of safety risk control. In situations such as this, variations in the individual value judgements of the decision makers are inevitable.

Please note that there are road design and traffic management control measures that must be provided irrespective of SFAIRP. Static signposting, pavement markings, line markings and delineation at passive and active railway crossings must be provided in accordance with RTA policies and guidelines, or the Australian Standard AS 1742.7 – *Manual of uniform traffic control devices Part 7: Railway crossings*.

1.2.3 The relationship between interface agreements and safety management plans

Section 29 of the NSW *Rail Safety Act 2008* requires a roads authority to seek to enter into an interface agreement with each of the rail infrastructure managers where a public road and railway cross.

This guideline assists planners to develop safety management plans. These plans assist the RTA to meet its obligations in relation to interface agreements under Section 29 of the NSW *Rail Safety Act 2008*, namely:

(a) To identify and assess, so far as is reasonably practicable, risks to safety.

(Planners are supported by steps 1 to 3 and Appendix A contained in this guideline, and related documents *Identify: The railway crossing safety hazard checklist* and *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*.)

(b) To determine measures to manage, so far as is reasonably practicable, those risks.

(Planners are supported by Step 4 contained in this guideline, and the related document *Evaluate: Applying the railway crossing cause consequence bow tie models*.)

(c) For the purpose of managing those risks, enter into an interface agreement.

(Planners are supported by Step 5 and Appendix B contained in this guideline. The resultant Safety Management Plan forms part of the Interface Agreement documenting how the RTA and the Rail Infrastructure Manager will cooperatively manage safety risks on an ongoing basis at all RCs which fall under their mutual control.)

1.2.4 Guiding principles

The planning and management of railway crossing safety management plans reflects the RTA's approach to road safety, traffic efficiency and risk management at RCs. The following principles must be used in the creation of RC safety management plans and in the management of safety risks and safety management measures at RCs and their surrounding road networks. The use of these principles will ensure a consistency of approach by RTA planners in all matters related to planning and managing safety at RCs.

1.2.4.1 Design for safety

A safe systems approach to road design and traffic management at an RC is one where the road, roadside areas and traffic management are designed in such a way that they provide a forgiving environment. In keeping with this, the RTA's response to the design and development of an RC is three-fold:

- The design provides a consistent message and considers all operational and geometric factors that may impact on safe driver behaviour and vehicle operation.
- The design considers the safety of all RC users.
- The design endeavours to reduce the risks of roadside hazards through redesign and/or relocation (for example, removing non-frangible roadside hazards from the clear zone).

Together these criteria can support the approach of providing a safer road environment for all road users at an RC.

1.2.4.2 Railway crossing management principles

The planning and management of a railway crossing safety management plan is a complex activity. The following principles frame the RTA's approach to the planning, risk management and administration of RCs. They should be used by RTA staff to guide all activities relating to the management of RCs.

- The RTA will consult, collaborate and communicate with rail infrastructure managers and local councils in the planning and management of RCs.
- The RC is an integral part of the traffic and road transport system. Consequently, the planning of an RC should work to integrate the RC with wider transport networks, including those for vehicles, cyclists and pedestrians.
- The RTA supports the objectives and principles of the Level Crossing Strategy Council (LCSC).
- The RC risk assessment will be based on each relevant organisation's risk framework, and will reflect the risk rating of RCs relative to all the risks managed by that organisation (for more information regarding risk assessment criteria refer to *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*).
- Risk assessments will be undertaken in accordance with current international risk management standards.
- Safety risks are not to be transferred or increased on rail or road networks during the planning, operation and maintenance of RCs and their control systems.
- In order to minimise risks at an RC, safety management measures will be considered at both the RC and the adjacent road network.
- The final decision on the risk rating of a safety management measure at an RC rests with the agency that has control of the infrastructure asset and system.
- Planners must seek to minimise the impact of the operation of an RC and the implementation and/or operation of safety management measures at that RC on traffic efficiency.
- All roadwork and traffic facilities for State roads must be approved by the RTA or by the relevant roads authority for all other roads.

- The RTA will proactively work to identify any change in risk at an RC for which it is a party to a safety management plan, by proactively working to identify both new hazards and hazardous events, and changes to existing hazards and hazardous events. The RTA will inform other relevant agencies of any identified change to risk at an RC as soon as practicable after the discovery or recognition of such a change.
- The RTA accepts the following three means of undertaking a risk assessment at an RC:
 - An independent risk assessment carried out by the RTA.
 - A joint risk assessment carried out by the RTA and the rail infrastructure manager.
 - A risk assessment carried out by a third party, such as the rail infrastructure manager, with the concurrence of the RTA.
- RC safety management plans must be stored in the document management system. Each RC safety management plan must have its own unique identifier.

1.2.4.3 The risk management process

Risk management involves developing a systematic method of identifying, analysing, evaluating and treating the risks associated with a specific function or activity. It is important that the people responsible for managing safety, and those responsible for managing maintenance, are included in the risk assessment.

The RTA's risk management process for RCs has been developed on the basis of the following documents and practices:

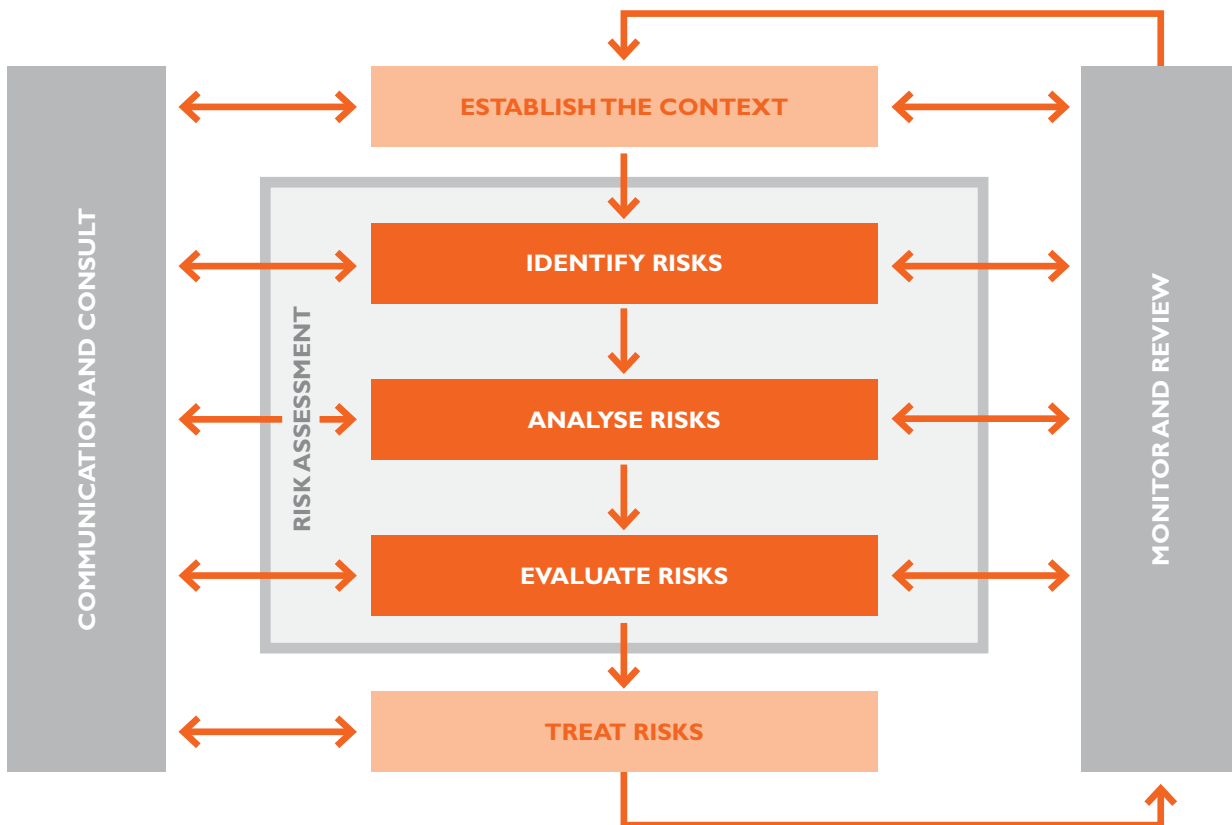
- The International Standard AS/NZS ISO 31000:2009 – *Risk management – Principles and guidelines*.
- A joint risk assessment carried out by the RTA, the rail infrastructure manager, and the local council.
- Existing RTA practices.
- Other relevant guidelines and standards.

The RTA's risk management process considers:

- The operational conditions present at an RC, in conjunction with the impact of the operation of the RC on the surrounding road network.
- A methodology to identify, assess and evaluate the risks generated by hazards and hazardous events at an RC.
- A methodology to identify, assess and evaluate safety management measures at an RC.
- The safety obligations specified in the *Occupational Health and Safety Act 2000* and the *NSW Rail Safety Act 2008*.
- The management of safety risks and safety management measures at an RC, 'so far as is reasonably practicable'.
- The obligations of the other agencies responsible for the planning, management and operation of an RC.

The following figure (Figure 1) illustrates the steps that constitute the RTA's risk management process.

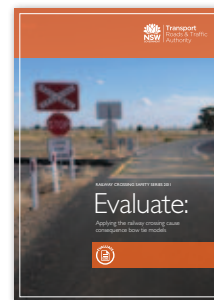
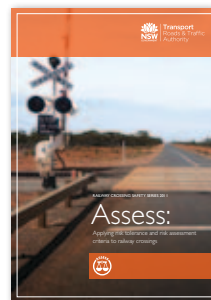
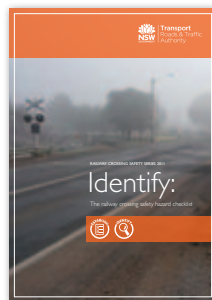
FIGURE 1: THE RTA'S RISK MANAGEMENT PROCESS



It is important to consider the views of all stakeholders during the risk assessment process. The preferred approach is to undertake risk assessments jointly, and to include at least the rail infrastructure manager and local council.

The following suite of tools and guidance material must be used by planners when undertaking the risk management process:

- The railway crossing Geographic Information System (GIS) database.
- *Identify:* The railway crossing safety hazard checklist.
- *Assess:* Applying risk tolerance and risk assessment criteria to railway crossings.
- *Evaluate:* Applying the railway crossing cause consequence bow tie models.
- The RC risk assessment tool.
- The RC safety management plan (template). (Contained in Section 8.4 of this document on page 45.)
- The RC safety risks and management arrangements. (Contained in Section 8.4 of this document on page 46.)



1.3 Outline of this guideline

This guideline is divided into six main sections, two appendices, a glossary and a reference list.

The guideline is structured so that planners can use the information provided in a number of ways. For those starting out, a review of the whole guideline will be required. More experienced planners, who are familiar with planning and managing safety risks, safety management measures and RC safety management plans, can use the following breakdown to identify which parts of the guideline are relevant to their purposes.

Section 1 (this section) outlines the purpose of this guideline, provides information on the legal status of interface agreements, outlines planning based on the 'so far as is reasonably practicable' principle, explains the relationship between interface agreements and RC safety management plans and provides a list of principles for the planning and management of RCs. In addition, this section outlines this guideline and provides guidance on how to use it.

Section 2 outlines the objectives and outcomes of the planning and management of safety risks, safety management measures and RC safety management plans. In addition, it describes RC safety management plans and provides guidance on why and when to use them. Lastly, Section 2 illustrates how Steps 1 and 3 of the planning and managing of the RC safety management plan process integrate into the RTA's *ProjectPack* and *MinorProject* project management systems.

Sections 3 through 6 detail the four steps of the planning and managing of RC safety management plans. More information on these sections is given below.

Section 3 describes Step 1 of the planning and managing of the RC safety management plan process. Section 3 is broken down into five major sections.

- Section 3.1 outlines the timeline of Step 1.
- Section 3.2 breaks Step 1 down into a 13-stage procedure, describing each stage separately.
- Section 3.3 lists the reference documents and templates planners should consult when preparing an RC safety management plan.
- Section 3.4 identifies the outputs that are produced through the process of generating a safety management plan.
- Section 3.5 provides a useful summary of Step 1. This includes a flow chart that spells out how the reference documents and templates relate to the various stages of the procedure and identifies at which points in the procedure the outputs are generated.

Sections 4 to 6 (steps 2 to 4) provide information on how to store, retrieve, monitor, update, and report on RC safety management plans.

Appendix A provides a detailed account of the risk assessment procedure used in the planning and management of safety risks, safety management measures and RC safety management plans.

Appendix B provides the checklists, memorandums and templates used to complete the four steps of the planning and managing of RC safety management plans.

Planning and managing safety risks and safety management measures at railway crossings is a complex activity. Figure 3 (page 13) provides an outline of the risk assessment process through to the final safety management plan, and indicates which documents to use at each stage of the process.

A comprehensive list of all reference documents is provided in Section 9 on page 52.

The glossary provided on page 53 clarifies all technical documents and terms used in this guideline.

1.4 Using this guideline

This document sets out a four-step process for preparing and managing RC safety management plans.

These four steps are schematised in the following flow chart (Figure 2).

FIGURE 2: RAILWAY CROSSING SAFETY MANAGEMENT PLAN PROCESS FLOW CHART



Use **Section 3 (Step 1)** for guidance on how to develop an RC safety management plan.

Use **Section 4 (Step 2)** for guidance on how to store and retrieve an approved RC safety management plan in the RTA document management system.

Use **Section 5 (Step 3)** for guidance on how to monitor activities associated with an RC safety management plan in order to ensure that legislative and business requirements are satisfied.

Use **Section 6 (Step 4)** for guidance on how to report on the status of safety management plans, including specific activities.

Refer to **Section 7 (Appendix A)** for a detailed breakdown of the risk assessment procedure that forms an integral part of Step 1.

The templates and checklists contained in **Section 8 (Appendix B)** provide simplified and standardised inputs and outputs for use in each step.

A list of important reference documents and a glossary are provided at the end of this guideline to assist planners and clarify key terms.

The goal of this guideline is to provide planners with:

- Easily understood and structured information on how to undertake a safety risk assessment and develop an RC safety management plan.
- Information to determine the time and resources necessary to plan and manage safety risk and safety management measures at an RC, and to plan and manage an RC safety management plan, bearing in mind the complexity, type and geographical location of the RC.
- A comprehensive administration framework for safety management plans to ensure that the RTA meets its legislative and business requirements.

1.5 Relevant documents

A suite of tools and guidance material has been developed to assist planners in the planning and management of an RC safety management plan, including:

- The railway crossing GIS database.
- *Assess: Applying risk tolerance and risk assessment criteria to railway crossings.*
- *Identify: The railway crossing safety hazard checklist.*
- *Evaluate: Applying the railway crossing cause consequence bow tie models.*
- The RC risk assessment tool.
- The RC safety management plan (template). (Contained in Section 8.4 of this document.)
- The RC safety risks and management arrangements. (Contained in Section 8.4 of this document.)

NOTE:

All safety management plans are 'living' documents and may change over time. Once an RC safety management plan has been drawn up and entered into, ongoing planning and management of the safety risks, safety management measures, and the safety management plan itself, will be necessary.



1.6 Preparing a safety management plan: An overview of the process and documents

FIGURE 3: HOW DOCUMENTS AND STEPS RELATE IN THE ASSESSMENT AND MANAGEMENT OF SAFETY RISKS AT RAILWAY CROSSINGS



Section 2

The safety management process for railway crossings

Planning and managing safety at railway crossings (RCs) is a complex activity and planners must ensure that their actions and decisions support the RTA's stated objectives and outcomes for RCs. The planning and management of safety risks and safety management measures are captured within RC safety management plans. Planners undertaking the creation and maintenance of RC safety management plans need to have an understanding of safety risks and safety management measures, and a knowledge of RC safety management plans and how to manage them.

This section provides planners with the necessary background information to: identify and manage safety risks at RCs; plan and manage safety management measures at RCs; and to plan and manage the RC safety management plans.

2.1 Objectives

The objectives of planning and managing safety risks, safety management measures and RC safety management plans are to ensure that:

- Safety risks at RCs on all roads under RTA control are identified for all road users, so far as is reasonably practicable.
- Safety management measures at RCs on all roads under RTA control are implemented, operated and maintained to minimise those safety risks, so far as is reasonably practicable.
- RTA knowledge and skills in identification and management of safety risks and safety management measures at an RC is maximised.
- RTA knowledge and skills in the planning and management of an RC safety management plan are maximised.
- RC safety management plans meet RTA obligations as spelt out in relevant legislation such as the *Occupational Health and Safety Act 2000*, the *Roads Act 1993* and the *Rail Safety Act 2008*.
- The management of RC safety management plans satisfies the RTA's legislative and business requirements.
- RC safety management plans form an integral part of railway crossing interface agreements, and assist the RTA to meet its obligations under the *NSW Rail Safety Act 2008*.

2.2 Outcomes

The planning and management of safety risks, safety management measures and safety management plans will help achieve the following outcomes:

- Road safety for all road users on roads under RTA control at, or within the area of influence of, RCs is maximised, so far as is reasonable practicable.
- RTA knowledge on risk management and planning, and management of safety management measures at RCs is maximised.
- The efficient planning and management of RC safety management plans.

2.3 Safety risks and safety management measures for a railway crossing

To successfully work through the risk assessment process and develop a safety management plan it is necessary to understand the terminology used and how the various tasks relate. Figure 3 on page 31 outlines the relationships between the tasks and the documents of the safety management process and this section explains the basic terminology.

What is a 'hazard' or 'hazardous event'?

A hazard or hazardous event is 'a source of potential harm or a situation with a potential to cause harm' (Standards Australia AS 4360:2004).

What is a 'safety risk'?

There are many types of risk, including safety risks. A safety risk is a potential event, the eventuation of which would negatively influence (that is, constitutes a threat to) the achievement of RTA safety objectives for RCs.

What is a 'risk assessment'?

Risk is a function of hazards and hazardous events, along with the amount of exposure to these hazards and hazardous events. It is assessed based on a hazard's likelihood of occurring, and the potential consequences if it does occur.

What is a 'safety management measure'?

A safety management measure is a treatment that acts to minimise the risks at a railway crossing. When identifying safety management measures, the RTA will consider:

1. Removing the hazard.
2. Substituting the hazard with another of less risk.
3. Isolating the hazard from the person at risk.
4. Minimising the risk by engineering means.
5. Minimising the risk by administrative means.
6. Using personal protective equipment.

It may be appropriate to use a combination of safety management measures to manage safety risks.

2.4 Railway crossing safety management plans

2.4.1 What is a railway crossing safety management plan?

A railway crossing (RC) safety management plan is a contract between the RTA and other relevant parties to ensure that all parties:

- **Identify** the risks to safety that arise from the design, management and operation of an RC.
- **Determine** measures to manage, so far as is reasonably practicable, those risks.
- **Document** risks and safety management measures, and other relevant information, to manage the identified risks and new risks on an ongoing basis.

RC safety management plans form an integral part of the RTA's railway crossing safety management system and underpin rail/road crossing interface agreements. An interface agreement covers all the road or rail crossings that are the responsibility of the RTA and a particular rail infrastructure manager. This includes at-grade (railway crossing) and grade separated (bridge) crossing types.

2.4.2 Why is a railway crossing safety management plan needed?

An RC safety management plan is used by the RTA to provide a consistent process and outputs that satisfy the requirements specified in the *NSW Rail Safety Act 2008*. An RC safety management plan provides a reference point for all agencies with an interest in an RC, in order to help them consistently document safety risks and safety management measures. In addition, an RC safety management plan provides a mechanism for communication between all relevant agencies on risk management for an RC.

Safety management plans form a critical part of interface agreements, and assist the RTA to meet its obligations under the Act to:

- (a) **Identify** and **assess**, so far as is reasonably practicable, risks to safety.
- (b) **Determine** measures to manage, so far as is reasonably practicable, those risks.

See Section 1.2.3 (page 6) for more details.

2.4.3 When is a railway crossing safety management plan needed?

The RTA has as a matter of policy, determined to enter into, or be a party to a safety management plan for every RC on State roads. In addition, the RTA should generally be a party to a safety management plan where an RC is connected to traffic control signals or a railway crossing not on a State road affects safety or the operation of a State road.

A railway crossing that is not on a State road but has infrastructure on a State road provides additional challenges for the parties responsible for safety at the railway crossing. In the spirit of cooperation and collaboration promoted in the *Rail Safety Act 2008*, the RTA may choose to be involved in the safety management plan for the RC, or may provide acknowledgement to the parties responsible that the RTA will maintain traffic control devices on the State road to the standards required in the Australian Standard AS1742.7.



2.5 Planning and management objectives and outputs of railway crossing safety management plans

The table below outlines the planning and management objectives and outputs for the four steps of the RC safety management plan's planning and management process.

TABLE 1: PLANNING AND MANAGEMENT OBJECTIVES AND OUTPUTS FOR PLANNERS.

Planning and management step	Objectives	Outputs
Step 1: Prepare a safety management plan for an RC	<ul style="list-style-type: none"> Identify the planning needs and objectives of, and information required for, the safety management plans. Identify the safety risks and safety management measures, so far as is reasonably practicable, for the RC. Complete a risk assessment of the RC. Develop a schedule and organise resources for the ongoing management of safety management measures at the RC. Obtain approval for the RC safety management plan. 	<ul style="list-style-type: none"> RC safety management plan.
Step 2: Store a safety management plan	<ul style="list-style-type: none"> Store the safety management plan in the RTA document management system. 	<ul style="list-style-type: none"> The correct storage of the safety management plan within the RTA document management system.
Step 3: Monitor a safety management plan	<ul style="list-style-type: none"> Undertake a review of the safety risks and safety management measures at an RC in accordance with the RTA's legislative, business and interface agreement requirements. Identify changes in the operation of the road or railway and changes in the condition of the assets. Instigate a review of the safety management plans, if warranted. Register the output of the monitoring activity in a safety management plan. 	<ul style="list-style-type: none"> The safety management plan is accurate and satisfies the RTA's legislative and business requirements. The RC is in accordance with the safety management plan.
Step 4: Report on the status of safety management plans	<ul style="list-style-type: none"> Prepare reports in accordance with RTA requirements. Forward completed reports to the relevant policy manager. 	<ul style="list-style-type: none"> Reporting on safety management plans satisfies legislative and business requirements.

2.6 Integrating the preparation and management of railway crossing safety management plans with RTA project management systems

Steps 1 and 3 of developing and managing a railway crossing (RC) safety management plan are integrated into phases of the project lifecycle as described in the RTA *ProjectPack* and *MinorProject* project management systems. The integration of these steps into the RTA *ProjectPack* and *MinorProject* systems is shown below in Tables 2.

TABLE 2: PROCESS STEPS IN THE RTA *PROJECTPACK* OR *MINORPROJECT* SYSTEM

<i>PROJECTPACK</i> delivery phase	Process step	Timeline description
Initiation		
Development Procedure TP0 - 103	Step 1: Prepare a safety management plan for an RC.	<ul style="list-style-type: none"> When sufficient project information is available. An element of 'Prepare preliminary concept designs for the selected options'.
Implementation		
Finalisation and operation Procedure TP0 - 901	Step 3: Monitor an RC and safety management plan.	<ul style="list-style-type: none"> Shortly after commissioning of a new RC configuration, roadwork or traffic management measure. An element of 'Finalise and handover the completed works'.
<i>MINORPROJECT</i> delivery phase	Process step	Timeline description
Concept Procedure TP0 - 002	Step 1: Prepare a safety management plan for an RC.	<ul style="list-style-type: none"> When sufficient project information is available. An element of 'Prepare concept design'.
Implementation		
Finalisation and operation Procedure TP0 - 901	Step 3: Monitor an RC and safety management plan.	<ul style="list-style-type: none"> Shortly after commissioning of a new RC configuration, roadwork, or traffic management measure. An element of 'Finalise and handover the completed works'.

Section 3

Step 1: Preparing a safety management plan for a railway crossing

This section provides guidance on the creation of a railway crossing (RC) safety management plan, including the identification and assessment of triggers, how to undertake consultation with internal and external stakeholders, how to undertake a risk assessment and how to document a safety management plan. Information on the approval and communication of a safety management plan is also provided.

3.1 Timeline

In general, this step is undertaken as soon as possible:

- After receipt of a request from a rail infrastructure manager, the local council, or a relevant third party.
- During the development phase of RTA road projects.
- Any other time as required by the interface agreement.

3.2 Procedure

Planners need to undertake the following tasks to complete Step 1.

3.2.1 Confirm that the RTA is partly or solely responsible for safety management measures at a railway crossing

In order to determine whether the RTA is partly or solely responsible for safety management measures at an RC, the planner should consult the RTA's railway crossing GIS database. This database contains information concerning the RC's location and infrastructure and is managed by the RTA's Road Information and Asset Management Technology Section.

The RTA will be a party to a safety management plan where the RC is on a State road. In addition, the RTA should generally be a party to a safety management plan where an RC is connected to traffic control signals or a railway crossing not on a State road affects safety or the operation of a State road.

A railway crossing that is not on a State road but has infrastructure on a State road provides additional challenges for the parties responsible for safety at the railway crossing. In the spirit of cooperation and collaboration promoted in the *Rail Safety Act 2008*, the RTA may choose to be involved in the safety management plan for the RC, or may provide acknowledgement to the parties responsible that the RTA will maintain traffic control devices on the State road to the standards required in the Australian Standard ASI 742.7.

The level of involvement of the RTA in safety management plans for RCs on regional and local roads will need to be assessed on a case-by-case basis. In most cases however, the effort would typically be considered minor in nature, since such safety management plans generally only require the RTA to maintain existing infrastructure on a State road and/or manage the operation of traffic control signals.

In complex situations planners should contact the Project Manager (railway crossings) regional Road Safety and Traffic Management (see interface agreement for contact information), in order to determine which roads authority has responsibility for an RC.

If an RC has been referred to the RTA incorrectly, the person or body who made the referral should be advised as soon as possible.

3.2.2 Triggers to review a railway crossing safety management plan

The triggers that require a review of an existing RC safety management plan include changes to rail or road infrastructure and changes in the operational characteristics and incidents at a specific RC. Some examples include:

- An RTA road project such as a new motorway, a major change to an existing arterial road, changes to an intersection adjacent to an RC, and so forth.
- The need for a new RC.
- A rail infrastructure manager project such as track duplication.
- Third party impacts such as a land use development application.
- A road network operational change. This includes changes in road traffic use, changes to the speed limit or road closure.
- A rail network operational change. This includes an increase in train frequency or speed, an increase in the length of trains, changes in train types and changes in rail line operational characteristics such as rail line closures.
- Safety compliance orders forwarded by ITSR.
- A railway crossing upgrade by the road or rail infrastructure manager, funded in New South Wales by the Level Crossing Strategy Council (LCSC) program and other programs.
- A crash or a near miss event at an RC.
- When road traffic control signals are connected to an RC control system.

In most instances a planner may assess the trigger. However, in complex situations the planner should contact the Project Manager (railway crossings) regional Road Safety and Traffic Management section in order to determine the contractual requirements of the interface agreement and provisions of the safety management plan. The Policy Manager, Road User Priority and Access, Traffic Management Branch can also be contacted for assistance.

Communications containing triggers that do not fall within the above-mentioned RC triggers must be forwarded to the Policy Manager Road User Priority and Access, Traffic Management Branch.

3.2.3 Obtain a copy of the interface agreement and the existing railway crossing safety management plan

The interface agreement and the current RC safety management plan, if it exists, should be obtained from the document management system. Each document has a unique identifier. Relevant items from these documents should be considered within the framework of the new RC safety management plan that is being developed.

3.2.4 Create a new railway crossing safety management plan

A new safety management plan will be required where one does not exist for an RC.

The RC safety management plan template (see Section 8.4 of this guideline) must be used for all RC safety management plans on State roads, and is encouraged for use on regional and local roads that involve infrastructure on a State road and/or the operation of traffic control signals on any public road. This will ensure consistency of practice.

The new RC safety management plan should be registered in the document management system and assigned a new unique identifier.

Information in the RTA's railway crossing GIS database concerning the RC should also be updated and referenced to the RC's new unique identifier.

3.2.5 Assess whether it is necessary to make changes to the safety management plan

Assessing the degree of impact of triggers

The impact of a trigger upon safety at an RC may vary. The degree of impact of a trigger on an RC influences the level of effort required by planners in reviewing safety management plans. Planners should therefore assess triggers in order to determine the level of effort required to address them before proceeding to the next tasks. Such assessments should, if possible, be undertaken together with the responsible rail infrastructure manager and local council.

Planners may be able to deal with simple updates and modifications to an existing RC safety management plan at a simple RC without a full stakeholder site meeting. However, following the assessment of the degree of impact of a trigger, any change to, or decision not to change, the safety management plan will require the agreement of the other responsible parties.

Deciding whether a risk assessment is needed

If the planner decides that a trigger requires only a minor change to an existing safety management plan, then it is unlikely that a risk assessment would be necessary. However, this decision must be confirmed by the responsible rail infrastructure manager and local council.

Minor changes to safety management plans

If planners, in conjunction with the responsible rail infrastructure manager and local council, decide that only a minor change to an existing safety management plan is required, they should proceed to developing an RC safety management plan, which is described in Section 3.2.10 of this guideline.

3.2.6 Confirm the need for a change to a safety management plan with the rail infrastructure manager and local council

The RTA should confirm the need to create a new safety management plan or review an existing safety management plan with the relevant rail infrastructure manager and local council.

If a planner decides to formally write to a rail infrastructure manager and local council, the planner should do this as soon as possible, using the template provided in Appendix B.

3.2.7 Assess the need for, and create, a project team

It is recommended that planners form a project team for:

- Complex RC configurations.
- Undertaking comprehensive reviews of existing RCs.
- Preparing new RC safety management plans.

RTA personnel on the project team can include representatives from:

- The Road Safety and Traffic Management section, Infrastructure Services Directorate.
- Other relevant functional areas of the RTA, as determined by the trigger, such as the Asset Management Branch.

In addition, a representative from the relevant rail infrastructure manager and local council must be invited to participate in the project team.

The responsibilities and commitments of, and communication arrangements for, each team member should be established at the outset.

3.2.8 Create a project plan and confirm financial arrangements

When establishing a project plan and timeline, it is important to recognise that the process will require periods of review by all the agencies involved. Realistic timeframes for these reviews need to be included in the timeline. A checklist is available (Section 8.1 of this guideline) to assist planners in the development of a project plan.

Note: Ensure funding approval is given before commencing the next steps.

3.2.9 Undertake risk assessment and identify safety management measures

The risk assessment required by a safety management plan is a collaborative process which includes the RTA, the responsible rail infrastructure manager(s) and the responsible local council(s). Meetings and workshops may be required. Planners need to confirm with the project team members that all affected infrastructure managers are included and that the proposed extent of the risk assessment is adequate.

The RTA's risk assessment procedure is provided in Appendix A of this guideline.

3.2.10 Develop a railway crossing safety management plan

A railway crossing safety management plan template is provided in Section 8.4 of Appendix B to assist planners in developing an RC safety management plan. All items in the template should be considered when developing the RC safety management plan.

During the documentation of the RC safety management plan the following should be undertaken:

- Compare and update the existing safety management plan for that site, if there is one, to meet the current railway crossing safety management plan template.
- Review the information provided by the rail infrastructure manager to ensure that the RTA finds it acceptable.

Planners requiring assistance in completing a safety management plan can contact the Project Manager (railway crossings) regional Road Safety and Traffic Management section or the Policy Manager, Road User Priority and Access, Traffic Management Branch.

3.2.11 Obtain approval for the railway crossing safety management plan

The Regional Manager, Infrastructure Services is the person responsible for approving RC safety management plans. A memorandum template is provided in Section 8.2 of Appendix B to assist planners in obtaining approval for their RC safety management plan.

In addition, the relevant rail infrastructure manager and local council also need to give approval for the safety management plan. A template is provided in Section 8.3 of Appendix B to assist planners in completing this task.

Planners should provide two copies of the RC safety management plan to both the rail infrastructure manager and local council requesting their approval. One copy is to be returned to the RTA; the other is for the rail infrastructure manager or local council to keep.

3.2.12 Update the RTA's document and risk register and store the approved safety management plan

Information regarding the safety management plan that is kept in the document management system must be updated as soon as practicable following approval for the safety management plan.

Upon receipt of the signed copy of the safety management plan from the rail infrastructure manager and local council, the safety management plan must be stored in the document management system.

RC safety management plans with risks rated Medium, High or Extreme are to be included in the RTA's RC Risk Register. This register is held by the Policy Manager, Road User Priority and Access, Traffic Management Branch.

3.2.13 Inform stakeholders

Internal and external stakeholders must be notified of the safety management plan's acceptance by all stakeholders.

3.3 Documents to consult when preparing a railway crossing safety management plan

Planners should consult the following documents when preparing a railway crossing safety management plan:

- The Interface Agreement between the RTA, the relevant rail infrastructure manager(s) and relevant local council(s).
- All previous risk assessment reports and the existing RC safety management plan.
- All relevant legislation and regulations (see the list of reference documents on page 52).
- Risk assessments for other sites with similar characteristics.
- Australian Level Crossing Assessment Model (ALCAM) output data.
- Crash history.
- Any independent risk assessments that have been carried out, such as rail infrastructure manager risk outputs, for the RC.
- The RTA's *Identify: The railway crossing safety hazard checklist*.
- The RTA's *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*.
- The RTA's *Evaluate: Applying the railway crossing cause consequence bow tie models*.
- The railway crossing risk management tool.
- The ARRB Group's 2010 *Development of a railway crossing risk assessment process and guideline*.
- The RTA's *Rail Level Crossing Safety Management Process – December 2009*.
- The RTA's *Rail Level Crossings Fact Sheet – December 2008*.
- Any existing (as built) drawings, documents, agreements and inventories of assets.
- AS/NZS ISO 31000:2009 – *Risk Management – Principles and Guidelines*.
- Standards Australia AS 1742.7 – *Manual of uniform traffic control devices Part 7: Railway crossings*.
- The Austroads *Guide to Traffic Management and Guide to Road Design*.
- RTA traffic management supplements to Austroads guides and AS 1742.7.

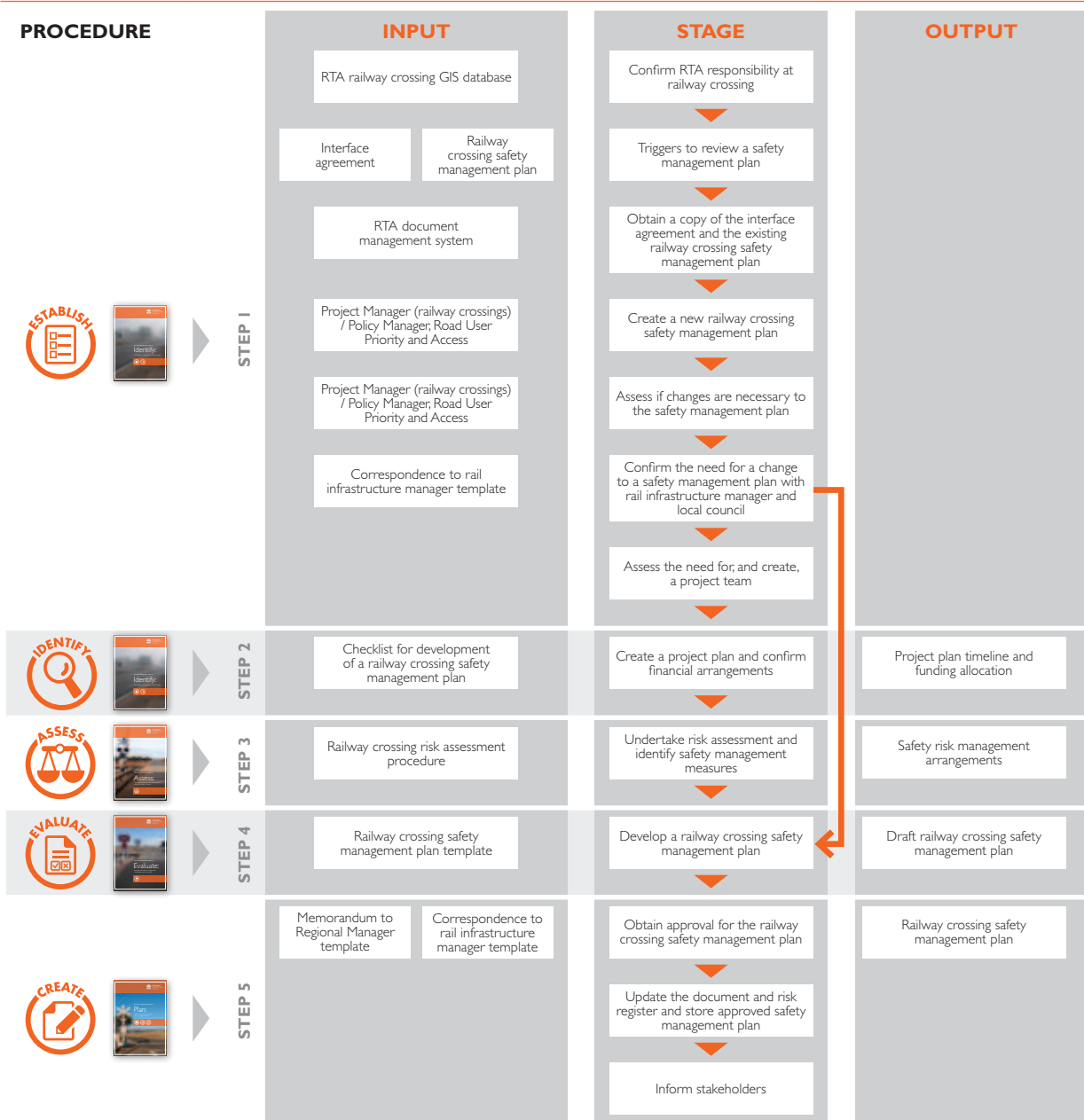
3.4 Outputs

The following outputs are produced through the process of generating an RC safety management plan (templates for these safety management plans are provided in Appendix B):

- Memorandum to Infrastructure Services Directorate Regional Managers and, where necessary, the Policy Manager, Road User Priority and Access, Traffic Management Branch.
- Correspondence to the rail infrastructure manager for advice and approval of a safety management plan.
- Correspondence to the local council for advice and approval of a safety management plan.
- The RC safety management plan.
- A completed checklist for the development of an RC safety management plan.

3.5 Summary of Step 1: Preparing a railway crossing safety management plan

Relevant person/s or step	
Implemented by	Planner
Triggers	<ul style="list-style-type: none"> Following receipt of a request from a rail infrastructure manager, local council or third party. Monitoring an existing RC safety management plan, as per the RTA's legislative or business requirements. During the development phase of RTA road projects.
Participants/consultation	<p>The RTA functional areas that can be consulted are:</p> <ul style="list-style-type: none"> The Infrastructure Services, Road Safety and Traffic Management section. The Infrastructure Services, Asset Management section. The Project Manager of the initiating road project (if applicable).



Approvals RTA Infrastructure Services Regional Managers, the rail infrastructure manager, the local council

Section 4

Step 2: Storing a safety management plan

The RTA must maintain a register of all interface agreements and all railway crossing (RC) safety management plans to which it is a party. In addition it must maintain a register of any arrangements determined by an appointed independent person under Section 30 (Part 2 – Div 2 – 33) of the *NSW Rail Safety Act 2008*.

In order to meet the legislative and business requirements of the RTA, RC safety management plans will be stored in the RTA's 'Objective' document management system. 'Objective' allows authorised personnel to create, register, 'version control' and review RC safety management plans.

Planners are required to meet RTA document control policies and procedures in addition to the following principles regarding the storage of agreements:

- Each RC safety management plan will have a unique identifier. The unique identifier will be provided by Traffic Management Branch, Network Services Directorate.
- Infrastructure Services will be responsible for the management of RC safety management plans in their regions.
- Traffic Management Branch, Network Services Directorate will be permitted to review all RC safety management plans.
- All information created to support an RC safety management plan will be stored in the document management system. This information will be linked to the relevant RC and stored in a manner that allows easy access for sorting and retrieval for reporting, reference and review.
- All performance reports for RC safety management plans will be stored in the document management system.
- All information supplied by third parties will be stored in the document management system.
- Modifications to existing RC safety management plans will be managed via version control.

Under the roll-out of 'Objective', RC safety management plans will be stored by the Policy Manager, Road User Priority and Access, and by the regional Road Safety and Traffic Management Branch.

Section 5

Step 3: Monitoring a railway crossing and its safety management plan

Entering into a railway crossing (RC) safety management plan obliges the parties to maintain the infrastructure for which they are responsible in acceptable operating condition, and to advise the other parties to the agreement of any changes to the operation of the RC.

An annual inspection of every RC must be undertaken. The inspection checklist provided in Section 8.5 of Appendix B must be used to document the condition of the infrastructure assets and the operation of an RC.

Any issues and any works that arise from an inspection must be captured in the checklist. The completed checklist must be added to the existing safety management plan.

An RC safety management plan must be no older than five years. However, the time limit may be less than five years, depending on the review timing stipulated in the relevant interface agreement. A new safety management plan must be created prior to the expiry of the relevant time limit. At high risk sites more frequent reviews may be warranted and the review timing should be agreed as part of the safety management plan.

Inspections can occur and, as a consequence of this, new safety management plans can be created, at times other than the five year renewal period. Examples of situations where this can occur include:

- The amendment, reform or rescission of current applicable legislation, regulations and/or policies which impact on the obligations contained in a safety management plan.
- Activities undertaken by the RTA, such as a traffic operational review, road safety review, asset maintenance inspection or road project.
- Changes to an RC brought about by one or all of the parties to the safety management plan, including (but not limited to):
 - The completion of infrastructure work (for instance, an upgrade, maintenance, or closure).
 - Communications projects undertaken by a relevant agency.
 - Changes in risk factors, such as changes in traffic type or road network changes.

Inspections should include representatives from the responsible rail infrastructure manager and local council.

An RC safety management plan must be updated within one month of a site inspection. The RTA target for the completion of any minor maintenance works that arise from an inspection is within one month of the inspection.

Section 6

Step 4: Reporting on safety management plans

A Statewide report will be prepared to monitor the RTA's management of all RCs under its control.

The Traffic Management Branch will coordinate the Statewide report. The report will be updated by each RTA region every six months.

The report will monitor the indicators below.

Indicator	Methodology	Target
Percentage of approved and up-to-date RC safety management plans.	RC safety management plans must be approved by the RTA, rail infrastructure manager, and local council (where applicable), and must meet monitoring requirements.	100%
Number of RC inspections completed at RCs in a region.	Each RC visited by an RTA officer, and checklist completed.	One inspection for each RC each year
Percentage of RCs compliant with RTA standards.	All RTA-controlled safety management measures must either meet RTA standards or be scheduled to be upgraded to this standard within one month of inspection.	100%

A template of the RC management report is provided in Section 8.6 of Appendix B for planners in each region to use.

Appendices

Section 7

Appendix A: The railway crossing risk assessment procedure

7.1 Purpose of the risk assessment procedure

The aim of the risk assessment procedure is to ensure that:

- The RTA undertakes risk assessment of railway crossings (RC) in a consistent manner.
- Safety risks at an RC on roads under the control of the RTA are managed so far as is reasonably practicable (SFAIRP).
- Safety management measures at an RC on roads under the control of the RTA are managed so far as is reasonably practicable (SFAIRP).
- The safety risks and the safety management arrangements are documented.

The overriding imperative is that a risk assessment must be 'suitable and sufficient' to identify and adequately assess foreseeable risks – the RTA is required to provide as safe an environment as they can, SFAIRP. In other words, doing a risk assessment simply for the sake of it is not good enough – there is an obligation to identify and treat all foreseeable risks, SFAIRP.

In a practical sense, the purpose of a risk assessment procedure is to assist the planner in the subsequent development of an RC safety management plan.

7.2 Guiding principles

To successfully undertake a risk assessment, the planner must have a good understanding of the RTA's safe systems approach, and an appreciation of the importance of the involvement of other parties with an interest in the safety of an RC.

In addition, it is important for the planner to recognise that the management of safety at an RC does not end after a risk assessment – but rather that effective management will involve ongoing monitoring and review to maximise RTA safety outcomes.

To promote consistency, planners should adhere to the following guiding principles when undertaking the risk assessment of railway crossings:

7.2.1 Designing for safety

A safe systems approach to road design and traffic management at an RC is one where the road, roadside areas and traffic management are designed in such a way that they provide a forgiving environment. In keeping with this, the RTA's response to the design and development of an RC is three-fold:

- The design provides a consistent message and considers all operational and geometric factors that may impact on safe driver behaviour and vehicle operation.
- The design considers the safety of all RC users.
- The design endeavours to reduce the risks of roadside hazards through redesign and/or relocation (for example, removing non-frangible roadside hazards from the clear zone).

Together these criteria can support the approach of providing a safer road environment for all road users at an RC.



7.2.2 Communicating and consulting with stakeholders

During risk assessment, ongoing communication and consultation with relevant stakeholders is essential to ensure that safety risks, and the planning and management of safety management measures at an RC, are managed effectively. This becomes even more important when multiple organisations are involved in providing the necessary duty of care.

When undertaking a risk assessment a planner must engage, as a minimum, with the rail infrastructure manager and local council, as these agencies will have obligations at an RC site during each step of the risk assessment procedure. The planner may also need to communicate or consult with other parties on a site-specific basis.

Note that consultation with the responsible agencies at a site ensures that those best placed to identify safety hazards and hazardous events are involved. This means that the RTA and these parties can collaboratively manage the safety management measures put in place to minimise the risks to safety.

7.2.3 Monitoring and reviewing

Ongoing monitoring and review is needed at all stages of risk assessment to ensure the required duty of care is being met. In particular, the impact of implemented safety management measures must be assessed, as the results of a measure may have unforeseen negative outcomes that should be taken into account during future risk management. This will help to refine future safety management measure options and minimise any negative consequences.

Where the monitoring and review of implemented safety management measures leads to a change in management practices, this should be captured within the RC safety management plan.

7.3 The risk assessment procedure: A step-by-step breakdown

The risk assessment procedure is broken down into five steps which are described in the remainder of this section. An outline of these five steps is provided directly below.

FIGURE 3: RAILWAY CROSSING RISK ASSESSMENT PROCEDURE FLOW CHART





7.3.1 STEP 1:

Establish the railway crossing objectives and scope

The aim of this step is to establish the objectives of the RC in terms of safety, efficiency and operation, and to determine the scope of the risk assessment procedure in terms of the features and 'area of influence' of the RC.

To facilitate this step, the RTA has produced a document titled *Identify: The railway crossing safety hazard checklist* which may be found on the RTA internet site. At this preliminary stage, the planner should complete Part A of the checklist in consultation with the project team.

Note that planners would normally conduct a desktop review and site inspection for Step 1. To complete this step the planner will need to undertake the following tasks:

1. Describe the RC site context, determine the planner for each agency and determine the 'area of influence' for the risk assessment.

There are four different areas that are influenced by the RC and its operation. These are:

- Road, bicycle and pedestrian areas within the railway reserve.
- Road, bicycle and pedestrian approaches to the RC.
- Rail approaches to the RC.
- Areas adjacent to road and rail approaches to the RC.

Identify: The railway crossing safety hazard checklist includes detailed information to assist planners in determining the area of influence, and should therefore be referred to at this stage of Step 1. Note, however, that the 'area of influence' of the RC must be agreed upon prior to the planner completing the checklist itself. In completing the agreement, the planner should attach (or provide references to) any relevant diagrams, photographs and technical or engineering drawings.

2. Determine the objectives for the RC.

The objectives for the RC will guide the risk assessment and its outcomes.

The RTA objectives for an RC can be found on the Traffic Management Branch's railway crossing internet page. The planner should either adopt these RTA objectives, or use them as the basis of the site-specific objectives for the RC.

3. Agree on existing safety management measures and agency responsibilities.

The safety management measures and responsibilities of the RTA and other responsible organisations at an RC, including infrastructure, systems and other activities, must be scoped and agreed upon by the relevant agencies.

The RTA's *Identify: The railway crossing safety hazard checklist* provides detailed information to assist planners in determining safety management measures and responsibilities. Planners should use this checklist to agree on the existing safety management measures and responsibilities for each agency.

4. Obtain information necessary for subsequent steps.

Background information should include the following:

Information	Source
Existing agreements.	RTA document management system.
Existing risk assessment reports.	RTA document management system.
ALCAM results.	TNSW
Railway crossing data (road and rail traffic volumes, site layout, road network treatments and operation, crash and near miss history, etc).	Infrastructure Services Road Safety and Traffic Management Section; rail infrastructure manager; ITSr; Police; local council.
Existing standards and guidelines.	Traffic Management Branch intranet site; Policy Manager; Road User Priority and Access, Traffic Management Branch.
Land use planning documents.	Infrastructure Services Land Use Development Section; local council.
Assets, asset ownership and operations such as traffic control devices, cabling etc.	Infrastructure Services Asset Management Section; Railway crossing planners Road Safety and Traffic Management Section; rail infrastructure manager; local council.
Current operation and asset monitoring and maintenance regime.	Infrastructure Services Asset Management Section; rail infrastructure manager; local council.
Emergency management and coordination arrangements at the RC.	Transport Management Centre; Infrastructure Services Traffic Operations Managers; rail infrastructure manager; local council.
Safety, environmental and community considerations.	Infrastructure Services Development Section, Road Safety and Traffic Management Section; local council.
RTA Stakeholders.	Infrastructure Services railway crossing planners Road Safety and Traffic Management Section; Policy Manager; Road User Priority and Access Network Efficiency Section, Traffic Management Branch, Infrastructure Services Asset Management Section; and Network Operations Section.
Road network development plans.	Infrastructure Services Development Section.

Additional information can also be obtained from other external parties.

5. Finalise the outputs from Step 1.

The planner should ensure that the relevant items in Part A of *Identify: The railway crossing safety hazard checklist* are completed prior to commencing the next step.



7.3.2 STEP 2:

Identify railway crossing hazards, hazardous events and safety risks

The aim of this step is to identify operational issues, hazards, hazardous events and safety risks at an RC.

At this stage it is important to identify all the relevant operational issues, hazards and hazardous events present at the RC, and to translate these into risks. This enables a proper analysis and evaluation of the RC context, and allows the planner to determine whether safety management measures are required and, if so, to determine which are most appropriate.

It is imperative that all risks are recognised. If a risk is overlooked, and therefore not included in the analysis and evaluation, it may go untreated. This leaves a potentially unacceptable exposure to risk for rail and road users, and the RTA.

Therefore the planners and project team will need to carefully identify all risks that are present at an RC. Many risks are well known and relatively easy to recognise. However, other risks are not well known, and may therefore require some foresight and careful consideration.

Note that planners would normally conduct a site inspection and risk assessment workshop for Steps 2 – 4.

The following tasks should be undertaken when completing this step.

1. Identify the hazards and hazardous events at an RC.

To identify the hazards and hazardous events at an RC, so far as is reasonably practicable, the planner should complete the hazard and hazardous event identification section in Part B of *Identify: The railway crossing safety hazard checklist*. The planner should do this in accordance with the provisions of Section 3 of that document and preferably in consultation with the project team.

2. Identify the risk categories at an RC.

The planner should identify the generic risks present at an RC, so far as is reasonably practicable. To assist the planner, generic risk categories that may be present are provided below:

- Road user fails to stop while a train is approaching an RC.
- Road user fails to keep an RC clear while a train is approaching.
- Road user fails to stay within travel lane, carriageway or path while approaching or traversing an RC.
- A failure in the operation of traffic control signals or active control.
- Road user fails to observe another road vehicle during the operation of an RC.

These five risk categories form the basis of the risk assessment process provided in *Evaluate: Applying the railway crossing cause consequence bow tie models*. The planner should consult that guideline to assist in allocating hazards and hazardous events to risk categories and risk types.

3. Identify specific risk types at an RC, so far as is reasonably practicable.

The risk categories provide groupings that reflect the general sources of potential safety failures at RCs, ie driver error or equipment failure. However, they are too broad to be applied in a risk assessment. Therefore the categories are refined through the introduction of 'risk types'.

Risk types allow a grouping of hazards and hazardous events that may be treated using specific safety management measures. For example, the risk category 'road user fails to stop while a train is approaching' has six identified risk types. One of these risk types is 'road user fails to observe traffic control device at RC'. There are a number of hazards and hazardous events that may lead to the road user failing to observe the traffic control device, such as sun glare, fog, overgrown vegetation, poor siting of warning signs, inadequate maintenance of control device, distraction from adjacent roadside activities, road alignment etc. There are also a number of potential 'safety management measures' to address this risk type, and some of these are common to other risk types as well.

One risk type can accommodate a number of hazards and hazardous events identified during the site inspection and completion of *Identify: The railway crossing safety hazard checklist*.

To see how risk categories, risk types, and safety management measures relate, and are interrelated, refer to Appendix 2 of *Evaluate: Applying the railway crossing cause consequence bow tie models*.

An RC presents many risks. However all agencies are not responsible, or accountable, for all risks; therefore the RTA must identify those risks for which it is accountable and ensure that all identified risks are assigned and will be managed by one of the parties to the safety management plan.

4. Identify and assess implications of agreed, planned and proposed changes to an RC in the short-term.

The planner must identify and assess the impact of an agreed, planned or proposed change to an RC that is scheduled to occur in the short-term. However, if it is not possible to assess the impact of the change, or if the outcome of the assessment is unclear, a review of the safety management plan must be undertaken following the change.

5. Finalise the outputs from Step 2.

The planner should ensure that Part B of *Identify: The railway crossing safety hazard checklist* is completed prior to commencing the next step.



7.3.3 STEP 3: Analyse existing railway crossing risks

The aim of this step is to assess the likelihood and consequences of existing safety risks at an RC and the adequacy of existing safety management measures in terms of minimising these safety risks. The adequacy of existing post-incident management measures to manage the consequences of an incident is also assessed. Where relevant, consideration should also be given to known future risks, such as a planned change to the road environment or a land use development plan. The rail infrastructure manager should be aware of any land use development applications that may affect the RC due to requirements placed upon the development consent authority under Division 15 of *State Environmental Planning Policy (Infrastructure) 2007*, and in particular Subdivision 2 of Division 15.

This risk analysis step is a way of estimating the existing level of risk. Before taking action (such as organising works, making changes in operation or even developing a safety management plan), the planner and project team need to understand the nature of the hazards and hazardous events and the level of the risk of each hazard. Understanding the nature of the risk means working out what could happen and why. Determination of the likelihood and consequence of risks associated with identified hazards and hazardous events needs to be systematic, objective and proportional to the significance of the risks under analysis.

The RTA uses qualitative analysis as a means of assessing risks, hazards and hazardous events. A qualitative analysis makes use of comparative scales – this allows for risk to be described by terms such as Extreme, High, Medium, Low or Negligible. Qualitative analysis is aided by consideration of existing rules and good practice. Existing good practice may be applied to simple decisions, but for more complex decisions additional methods of analysis may be required.

Detailed information to assist planners in undertaking a risk assessment is available in *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*.

The RTA risk assessment tool should be used in completing this step.

The following tasks should also be undertaken when completing this step:

1. Analyse the adequacy of existing safety management measures in minimising risks.

The RTA must consider safety management measures for risks for which it is accountable. The planner must determine the likelihood and consequence of those risks in light of the existing safety management measures.

2. Identify risks that require further evaluation.

Risks rated as Negligible and Low are considered broadly acceptable.

Those risks that are Extreme, High and Medium must be identified. Risks in these categories will require further evaluation to minimise the risk to a Low level. The agency accountable for minimising the risk must be identified.

3. Finalise the outputs from Step 3.

Prior to finalising the output for Step 3 the risk assessment team should undertake a final review of its decisions concerning the safety risks.

When all the safety risks are considered together and in relation to each other, the team may decide to reconsider, review and revise the ratings of each risk until it is judged to be appropriate and a true reflection of the situation.



7.3.4 STEP 4:

Evaluate railway crossing safety management measures

The aim of this step is to reduce safety risks rated Medium, High and Extreme at an RC to a Low or Negligible level, so far as is reasonably practicable. This is done through the application of a hierarchy of safety management measures including operations, behavioural and infrastructure initiatives. Planning and managing safety management measures so far as is reasonably practicable recognises that a balance is required between managing a safety risk and the time, effort, resources and costs involved.

In this context, 'safety management measures' include measures taken to both reduce the likelihood of an incident occurring and to reduce the consequences of an incident, should it occur. Both types of safety management measures should be considered during the risk assessment stage.

Note that in *Evaluate: Applying the railway crossing cause consequence bow tie models*, the term 'safety management measure' is used for safety management measures aimed at reducing the likelihood of an incident occurring and 'post-incident management measure' is used for safety management measures aimed at reducing the consequences if an incident does occur. However for ease of reading, in this guideline the term 'safety management measure' encompasses all measures used to reduce the likelihood and consequences of incidents, including the consequences of an incident itself, unless stated otherwise.

Applying a hierarchy of safety management measures can assist a planner to identify the range of management options available to address the risks present at an RC. In practice, using the hierarchy of safety management measures is not intended to be a comparison between alternatives, but instead an analysis of the most effective combination of measures to reduce risks so far as is reasonably practicable.

Risk is a function of likelihood, consequence and exposure. As such, risk can be reduced by the following measures:

- Reducing the likelihood of an incident occurring (for instance, installing advance warning signage to raise road user awareness of the presence of the RC).
- Reducing the consequence of an incident once it does occur – that is, reducing the severity of a crash along the continuum of fatality, injury or property damage only (for instance, by replacing non-frangible infrastructure with a frangible type).
- Reducing exposure to hazards (for instance, upgrading to a more active form of protection, such as from a Stop sign to flashing lights, bells and boom gate controls).

To assist planners in undertaking a site inspection and to evaluate safety management measures, the RTA has generated two documents, *Assess: Applying risk tolerance and risk assessment criteria to railway crossings* and *Evaluate: Applying the railway crossing cause consequence bow tie models*, both of which are available on the RTA internet site.

The following tasks should be undertaken in completing this step:

I. Identify additional safety management measure options for each risk that is rated Extreme, High or Medium.

The RTA is accountable for the provision of safety management measures to minimise safety risks under its control, so far as is reasonably practicable.

The planner should consider safety management measure options with an aim to minimise the risks at an RC, on the road approach to and departure from an RC, and in the areas adjacent to the road and rail approaches. These safety management measures include:

- The closure of an RC to eliminate safety hazards present.
- The implementation of engineering treatments such as upgrades to traffic control.
- Changes to maintenance or operational practices.
- Administrative changes such as enforcement activities.
- The introduction of campaigns to educate drivers, pedestrians, cyclists or train operators to influence responsible behaviour and heighten awareness of the risks at an RC.

Planners also need to consider post-incident management measures that may reduce the consequences of an incident, should an incident occur. *Evaluate: Applying the railway crossing cause consequence bow tie models* presents the potential consequences of an incident and gives examples of post-incident management measures that can be taken to reduce the severity of these potential consequences. Post-incident management measures include:

- The use of frangible infrastructure.
- Monitoring of the site, for example, by CCTV.
- The implementation of emergency response plans.
- The implementation of emergency management plans.
- The implementation of traffic management plans to divert traffic in the case of an incident.

When planners evaluate the various safety management measure options, they should take into consideration any safety management measures that are already in place and determine what additional measures are applicable. In most cases a combination of these measures may be appropriate.

2. Estimate the cost of the safety management measure options.

Planners should base their estimates for the costs of all safety management measure options on a realistic consideration of project costs.

3. Evaluate the adequacy of each proposed additional safety management measure option to reduce the risk level so far as is reasonably practicable.

The safety management measure option evaluation should consider all criteria, impacts and what is reasonably practicable within the current financial year funding allocation to determine the preferred treatment.

4. Identify residual risks and estimate their cost.

Residual risks are those that are designated Extreme, High and Medium and that cannot be reduced to Low under current funding arrangements.

The cost estimates for all safety management measure options that are required to reduce the risks to Low should be estimated based on a realistic consideration of project costs.

Note that the Infrastructure Services Regional Manager is to be informed of any residual risks rated as Extreme, High or Medium.

5. Prioritise the safety management measures.

The safety management measures, and the management of these measures, should be prioritised by the planner in consultation with the project team.

6. Finalise the outputs from Step 4.

Prior to finalising the outputs from Step 4, the risk assessment team should undertake a final review of its decisions concerning safety risks and the existing and proposed safety management measures.

When all the safety risks, and existing and proposed safety management measures are considered together and in relation to each other, the team may decide to reconsider, review and revise the measures. A final adjustment of the relative priority of each measure may be required until it is judged that the measures are appropriate, and a true reflection of the situation.

The planner should ensure that the Railway Crossing Risk Assessment Tool is completed prior to commencing the next step.



Note that safety management measures which involve the ongoing maintenance of existing infrastructure and the operation of existing traffic control signals will be funded by RTA traffic facility and road maintenance programs under existing arrangements.

In circumstances where a safety management measure will require a change to existing infrastructure or the provision of new infrastructure at an RC, this will be funded by the Department of Transport Level Crossing Improvement Program. Recommendations of safety management measures which require changes to existing infrastructure must take into account the 'so far as is reasonably practicable' and 'design for safety' principles discussed in Section 1 of this guideline.

The funding for changes to existing infrastructure, or for the provision of new infrastructure at an RC, where the safety management measure has been identified as part of an RTA road project, is to be covered by the RTA road project. Changes triggered by another agency/proponent are to be funded by that agency/proponent.



7.3.5 STEP 5: Agree on the railway crossing safety management plan

The aims of this step are to:

- Confirm that all relevant parties have agreed to the selection of the safety management measures to be used to manage risks at the RC so far as is reasonably practicable.
- Create an RC safety management plan.

To facilitate this step a template for a railway crossing safety management plan is available in Section 8.4 of Appendix B. The planner should complete this template in consultation with the project team.

The following tasks should be undertaken in completing this step.

1. Document the existing and proposed safety management measures to be used to manage the safety risks at an RC.

Those existing safety management measures and additional safety management measures that were agreed upon during the risk assessment should be documented at this stage.

2. Determine the agency responsible for implementing, operating and maintaining safety management measures.

The agency nominated will be the agency identified as being responsible for rail and road infrastructure in Step 1. Generally this will be in accordance with the interface agreement, however due to site-specific variations in infrastructure and risks, local arrangements may be made for assigning the responsibility of managing those risks. If local arrangements are made, this must be identified in the safety management plan.

3. Determine the timeframe for implementing safety management measures.

A timetable for the implementation of safety management measures should be agreed upon and recorded.

4. Finalise the outputs from Step 5.

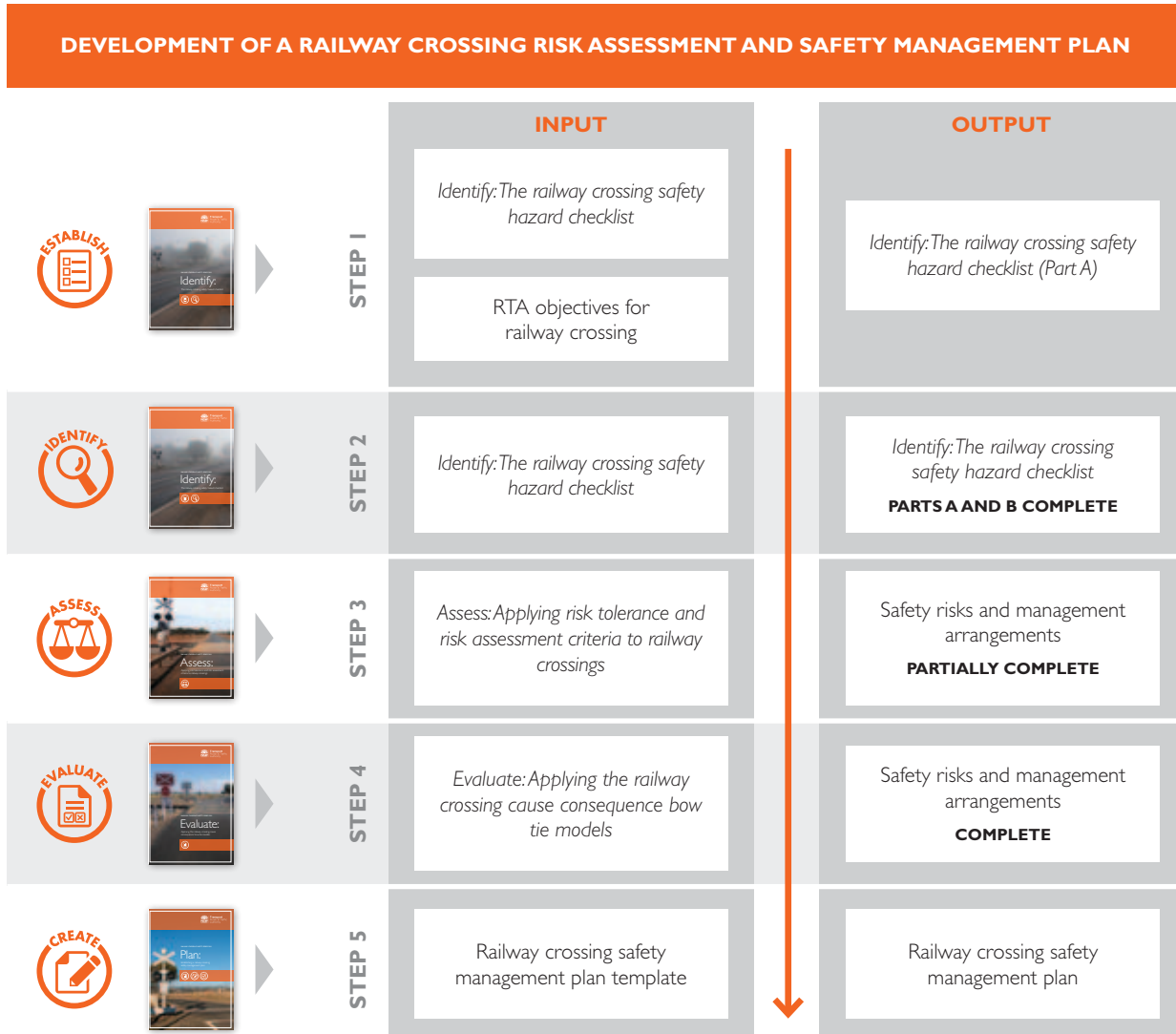
The planner should now complete the safety management plan.

7.4 Reference documents used in the risk assessment procedure

The risk assessment procedure requires planners to consider information in a number of RTA policy and technical references to satisfactorily complete all steps.

To assist planners, a diagram linking the most important reference material to the five-step process is provided below. Other reference documentation may also be required in completing a step.

FIGURE 4: SUMMARY OF THE RISK ASSESSMENT PROCEDURE AND REFERENCE MATERIAL



Section 8

Appendix B: Checklists and templates

8.1 Checklist for preparing a railway crossing safety management plan

Task	Complete (Y/N)
1 Changes to legislation such as the NSW <i>Rail Safety Act 2008</i> , <i>Roads Act 1993</i> , <i>Occupational Health and Safety Act</i> are incorporated.	<input type="checkbox"/>
2 Changes to organisation names and signatories are checked.	<input type="checkbox"/>
3a Safety management plan template is used.	<input type="checkbox"/>
3b If the answer to 3a is no, is the safety management plan structure and content acceptable to the RTA?	<input type="checkbox"/>
4 Approval of the safety management plan is received from all relevant internal stakeholders.	<input type="checkbox"/>
5 The safety management plan is signed by the RTA's Infrastructure Services Regional Manager, or delegate.	<input type="checkbox"/>
6 Approval is received from the rail infrastructure manager and local council.	<input type="checkbox"/>
7 The safety management plan is registered in the RTA's document management system.	<input type="checkbox"/>
8 Internal stakeholders are informed.	<input type="checkbox"/>

Planner: _____

Date: _____

8.2 Memorandum to Regional Manager Infrastructure Services (template)

To: [Insert recipient name]
Regional Manager, Infrastructure Services [insert name of Region]

CC: [Multiple recipients]

From: [Sender name] **Date:** [Date]

Ref: [Recipient reference] **Pages:**

File no: [File number]

Subject: Railway crossing safety management plan between RTA, [insert rail infrastructure manager's name] and [insert local council's name].

MEMO

Issue

Railway crossing safety management plan between RTA, [insert rail infrastructure manager's name] and [insert local council's name] at [insert location of railway crossing].

Background

[Insert details]

Comment

[Insert details]

Recommendation

It is recommended that you approve the release of the safety management plan between the RTA, [insert rail infrastructure manager's name] and [insert local council's name].

Attachments

Railway crossing safety management plan between the RTA, [insert rail infrastructure manager's name] and [insert local council's name] at [insert location of railway crossing].

[Insert Planner name]

[Insert Region name]

[Insert Regional Manager name]

[Insert Region name]

APPROVED / NOT APPROVED / APPROVED WITH CHANGES

8.3 Correspondence to rail infrastructure manager and local council for advice and approval of a railway crossing safety management plan (template)

[On RTA headed notepaper]

[Insert title of rail infrastructure manager] or [insert title of local council]

[Insert address]

Attention: [Insert name notified by rail infrastructure manager] or [insert name notified by local council]

Dear

RE: Railway crossing safety management plan between the Roads and Traffic Authority of New South Wales (RTA), [insert name of rail infrastructure manager] and [insert title of local council] for the management of safety risks and safety management measures at [insert location of railway crossing]

As you would be aware the RTA, [insert name of rail infrastructure manager] and [insert title of local council] have been collaborating on a safety management plan for the management of safety risks and safety management measures at [insert location of railway crossing].

The attached safety management plan is submitted for your consideration and signature, if you concur.

Please sign the attached duplicate of the safety management plan where indicated to confirm your acceptance of the safety management plan.

The RTA has identified a trigger to review the existing [insert details of safety management plan].

The RTA's consideration of the trigger has highlighted the need to undertake [insert details of action proposed to be undertaken].

As the safety management plan is between the RTA, [insert name of rail infrastructure manager] and [insert title of local council] your comments on the above-mentioned action is sought.

The RTA would appreciate early advice from [insert name notified by rail infrastructure manager] or [insert name notified by local council] on its proposed actions so that planning and resource allocation can commence.

Please contact [insert name and position title] on [insert contact telephone number] should you wish to discuss this matter.

Yours faithfully

[ROADS AND TRAFFIC AUTHORITY OF NEW SOUTH WALES]

[Insert name]

[Insert position title]

8.4 Railway crossing safety management plan (template)

General information

Site No.: _____

Railway crossing (RC) reference number: (use LXM ID – previously known as ALCAM ID)

Railway crossing location:

Line section:

Km:

GPS location: (GDA94, decimal deg) E:

Road name:

S:

RTA region:

Local government area:

Name of nearest crossroad:

Distance offset and direction of nearest crossroad:

RC area of influence:

Risk assessment reference no.:

Risk assessment date:

Authorisation

Rail infrastructure manager(s):

EXECUTED for and on behalf of:

Authorised signatory:

Date:

Roads and Traffic Authority of New South Wales:

EXECUTED for and on behalf of:

Authorised signatory:

Date:

Local council:

EXECUTED for and on behalf of:

Authorised signatory:

Date:

Document Control

All revisions to this document are to be recorded against the revision history (below) and conducted in accordance with the current RTA revision procedure.

All revisions to this document must be authorised, in writing, by the Regional Manager, Infrastructure Services, or delegate prior to implementation/release or communication.

Reference no:	Issue	Date	Reason and changes made	Parties to the safety management plan
	1			
	2			
	3			

Safety Risks & Management Arrangements

LXM Ref No.: _____

Railway crossing location: _____

Compiled by: _____

Date: _____

Reviewed by: _____

Date: _____

Approved by: _____

Date: _____

Nominated Risk Manager: _____ Date of Plan Approval: _____

The risk in priority order from risk assessment	Management category (Maintenance, operation, upgrade, education, enforcement)	Safety management measure	Person responsible for implementation of measure	Timetable for implementation or review	How will this risk and safety management measure be monitored
Example text	Maintenance	<ul style="list-style-type: none"> Warning signposting Longitudinal linemarking 'Rail X' pavement marking 	Maintenance Manager	Comply to RTA standard	Formal site inspection once per 12 months Adhoc site inspections during other duties
Example text	Upgrade	<ul style="list-style-type: none"> Plan, develop and implement infrastructure improvement upgrade 	Road Safety and Traffic Management Manager	When funds become available via LCSC LCIP	Formal site inspection once per 12 months Adhoc site inspections during other duties
		•	•		
		•	•		
		•	•		
		•	•		
		•	•		
		•	•		
		•	•		
		•	•		
		•	•		

Contact details for responsible parties

Party	Address for notices	Contact details for meetings and reports	Contact details for emergencies, occurrences and incidents
Rail infrastructure manager:			
[Insert name or position of rail infrastructure manager]	[Insert organisation and address]	[Insert telephone and fax numbers]	[Insert additional contact and/or contact details]
Road managers:			
Roads and Traffic Authority of New South Wales:	[Insert organisation and address]	[Insert telephone and fax numbers]	[Insert additional contact and/or contact details]
Local council:	[Insert organisation and address]	[Insert telephone and fax numbers]	[Insert additional contact and/or contact details]

8.5 Railway crossing safety monitoring checklist

General information

Railway crossing location:	RTA Representatives:
Representatives present from other agencies (eg rail, local council, police):	
Line section:	Km:
GPS location: E:	Road name:
S:	
RTA region:	Local government area:
Name of nearest crossroad:	Distance offset and direction of nearest crossroad:
RC area of influence:	
Day-time inspection date:	Time:
Night-time inspection date:	Time:

RTA railway crossing safety management control measures

Control measure	Yes / No	Condition	Photographs
RC control			
Give Way sign assembly (RX-1: R1-2, R6-24/R6-25, W7-2-1/W7-2-2)			
Stop sign assembly (RX-2: R1-1, R6-24/R6-25, G9-48, W7-2-1/W7-2-2)			
Bells, lights and signs (RX-5: R6-25, W7-2-2, R6-9)			
Gate assembly (RX-6: R6-24/R6-25, W7-2-1/W7-2-2, R6-8)			
Boom gates			
Communication to road traffic control signals			
Communication to active advanced warning			
Passive pedestrian controls (W7-14-4, W7-14-5, W7-14-6, G9-68, R2-4)			
Active pedestrian controls (RX-12: W7-14-6, G9-68, R2-4)			
Cyclist controls (G9-58)			
Other control measures			

Control measure	Yes / No	Condition	Photographs
RC signposting			
Road regulatory signposting (R5-400)			
Advanced warning (RX-10, RX-3-1/ RX-3-2/ RX-3-3, W7-7, W8-5)			
Width marker (RX-9, G9-32, G9-33, D4-3)			
Stop Sign Ahead (W3-1)			
Flashing Signals Ahead (W7-4)			
Active advanced warning (with flashing lights) (RX-11, W7-4, W8-27)			
Keep Tracks Clear (G9-67-1, G9-67-2)			
Chevron Alignment Marker (D4-6)			
Other signs (ie RX-4, RX-7, RX-8, W7-4, W7-7, W8-3, W7-12, W7-13, W7-15, W7-17)			
RC pavement markings			
Give Way line (TB)			
Stop line (TF-2)			
Edge line (E1)			
Centre/Barrier line (BB or BS)			
'Rail X' markings			
Box markings (cross hatching)			
Other control measures			
Delineation			
Flexible guide posts			
Raised pavement markers			
Other control measures			
Road crash barriers			
Crash barriers associated with protecting the railway crossing traffic control device (eg flashing lights)			
Crash barriers associated with protecting road features on approach to the RC (eg batter slope protection)			
Road network			
Road pavement (road responsibility)			
Road pavement (rail responsibility)			
Traffic control signals			

Control measure	Yes / No	Condition	Photographs
Shoulder			
Clear zone			
Footpath / shared path			
Landscaping, roadside vegetation and infrastructure in clear zone and footpaths			
Other control measures			
Road lighting			
Road			
Pedestrian			
RC flood lighting			
Other items			
Land use planning and development assessment			
Enforcement of road user behaviour			

Summary asset condition and operation

Brief description of asset condition of RTA infrastructure assets:

Brief description of issues relating to RTA road infrastructure, maintenance and operation of safety management control measures:

Comments on works to be undertaken that were identified during the site inspection:

Section 9

Reference documents

Internal reference documents

- Arrangements with local councils: <http://www.rta.nsw.gov.au/doingbusinesswithus/lgr/index.html>.
- *The RTA Level Crossings Fact Sheet* – December 2008.
- *The RTA The Level Crossing Safety Management Process* – December 2009.
- *The RTA Railway Crossing Risk Management Tool*.
- *The RTA Road Design Guide*.
- *The RTA Identify: The railway crossing safety hazard checklist (policy number PN241G)*.
- *The RTA Assess: Application of Risk Tolerance and Risk Assessment Criteria in the Railway Crossing Risk Assessment Procedure (policy number PN238G)*.
- *The RTA Evaluate: Applying the railway crossing cause consequence bow tie models (policy number PN240G)*.
- RTA Supplements to Austroads and Australian Standards <http://www.rta.nsw.gov.au/doingbusinesswithus/guidelines/index.html>.

External reference documents

- ALCAM Model outputs.
- ARRB 2010 *Development of a railway crossing risk assessment process and guideline*.
- Australian Standard AS/NZS ISO 31000:2009 – *Risk Management – Principles and Guidelines*.
- Australian Standard AS 1742.7-2007 – *Manual of uniform traffic control devices Part 7: Railway crossings*.
- Austroads *Guide to Traffic Management* series.
- Austroads *Guide to Road Design* series.
- Austroads 2008, *Glossary of Austroads terms*, AP-C87/08, 3rd edn, AP-C87/08.
- National Transport Commission June 2008, *National Rail Safety Guideline Meaning of Duty to Ensure Safety So Far as is Reasonably Practicable*.
- Australian Standard AS 1158 – 2005 – *Lighting for roads and public spaces*.
- Relevant legislation and regulations such as:
 - *Environmental Planning and Assessment Act 1997*.
 - *NSW Road Rules 2008*.
 - *NSW Rail Safety Act 2008*.
 - *Occupational Health and Safety Act 2000*.
 - *Roads Act 1993*.
 - *Rail Safety (General) Regulation 2008*.
 - *Road Transport (Safety and Traffic Management) Act 1999*.
 - *State Environmental Planning Policy (Infrastructure) 2007*.

Section 10

Glossary

- **Active advance warning sign:** a sign that provides advance warning of the impending or current operation of flashing signals at a railway crossing through the use of flashing yellow signals within the advance warning sign. These comprise the RX-11 assembly provided in AS 1742.7.
- **Active control:** controlling the movement of vehicular or pedestrian traffic across a railway crossing using devices such as flashing signals, gates or barriers (or a combination of these), where the device is activated prior to, and during, the passage of a train through the crossing. These comprise the RX1, RX2 and RX5 assemblies as defined in AS 1742.7. See also the glossary entry for 'passive control'.
- **ALCAM:** the Australian Level Crossing Assessment Model. A quantitative risk assessment and risk ranking tool used to assess and prioritise railway crossing risks across New South Wales. See www.transport.nsw.gov.au/sites/default/file/levelcrossings/ALCAM_In_Detail-NSW.pdf.
- **Barrier:** an alternative term for a safety management measure.
- **Bow tie model:** a qualitative risk assessment technique that 'links' the relationships between the causes of crashes ('risks'), the initiatives or controls designed to mitigate the potential for a crash ('safety management measures'), the crashes ('incidents'), the initiatives or controls designed to reduce the negative outcomes of an incident ('post-incident management measures'), and the outcome of an incident despite the initiatives and controls ('consequences'). The bow tie model is an integral part of the RTA railway crossing risk assessment and management procedure.
- **Broadly acceptable:** a level of risk deemed to be Low or Negligible and, when considered in the context of all risks being managed by the organisation, requiring no further action to comply with the 'so far as is reasonably practicable' principle.
- **Clear zone:** the area adjacent to the traffic lane that should be kept free from features that would potentially be hazardous to errant vehicles. The decision of whether or not to include a clear zone is based on the consideration of the recovery area for every errant vehicle, the cost of providing that area, and the probability of an errant vehicle encountering a hazard. The clear zone should be kept free of non-frangible hazards where economically and environmentally possible. Alternatively, hazards within the clear zone should be treated to make them safe or be shielded by a safety barrier (Austroads, 2008).
- **Consequence:** the outcome of an incident that has arisen from a risk. In the context of a railway crossing, a consequence may involve the injury and/or death of road or rail users, delays to people and freight on the road or rail networks, and property and environmental damage. Note that:
 - There can be more than one consequence from one incident.
 - Consequences can be expressed qualitatively or quantitatively.
 - Consequences are considered in relation to the achievement of RTA objectives, especially those related to road safety.
- **Coordination provisions of the NSW Rail Safety Act 2008:** the purpose of these provisions is to ensure that rail infrastructure managers and roads authorities identify risks to safety arising from rail or road crossings, so far as is reasonably practicable, determine measures to manage, so far as is reasonably practicable, those risks, and seek to enter into agreements to manage those risks.

The provisions are intended to ensure that risks arising from rail or road crossings are identified and that the accountabilities for risk control measures are clearly articulated.

- **Crash:** see the glossary entry for 'incident'.
- **Design for safety:** design that uses a safe systems approach. See also the glossary entry for 'safe systems approach'.
- **Frangible:** Roadside furniture designed to collapse on impact. The severity of potential injuries to the occupants of an impacting vehicle is reduced, compared to those that could occur if the furniture was unyielding.
- **GIS database:** see the glossary entry for 'Railway crossing GIS database'.
- **Hazard or hazardous event:** a source of potential harm or a situation with a potential to cause harm (as defined in AS 4360: 2004). A hazard is anything that may cause a risk – here 'risk' includes physical risks (eg, objects), environmental conditions (eg, fog) and road user behaviour (eg, crossing the centre line). See also the glossary entry for 'risk'.
- **Hazard identification:** the process of identifying and characterising hazards that exist or potentially exist.
- **Hierarchy of control:** a legal and logical preference of treating or controlling risk. For example, using the principles of SFAIRP and incremental road safety to spread limited resources across many demands.
- **Incident:** a crash at, or as a result of the operation of, a railway crossing. Incidents occur where safety management measures either fail, or are not present, when required. Incidents can include: a vehicle or pedestrian being struck by a train; a vehicle or pedestrian being struck by a vehicle; and railway crossing infrastructure being struck by a vehicle.
- **Infrastructure:** the network and devices used to carry or display the information, services and equipment required for the operation of railway and road systems. These include railway crossing control systems and equipment, such as flashing lights, boom gates, signal huts or culverts to clear stormwater.
- **Interface agreement:** an agreement in writing regarding the management of risks to safety that are identified and managed under Division 3 of the *NSW Rail Safety Act 2008*. An interface agreement includes provision for:
 - The implementation and maintenance of measures to manage those risks.
 - The evaluation, testing and (if appropriate) revision of those measures.
 - The respective roles and responsibilities of each party to the agreement in relation to these measures.
 - A process for reviewing and revising the agreement.
- **ITSR:** the Independent Transport Safety Regulator. See www.transportregulator.nsw.gov.au
- **LCSC:** the Level Crossing Strategy Council. See www.transport.nsw.gov.au/levelcrossings
- **Level crossing:** the area where a road and a railway meet at substantially the same level. Please note, however, that a level crossing does not include the road related area, such as the road shoulder, the dividing strip and pedestrian paths (see Rule 120 of the *NSW Road Rules 2008*). 'Level crossing' is used colloquially as an alternative term for a railway crossing.
- **Likelihood:** a general description of probability or frequency. In the context of a railway crossing, likelihood refers to the probability of an incident occurring.
- **Local road:** an administrative category of roads in NSW. Local roads are under the care, control and funding of local governments. See www.rta.nsw.gov.au/doingbusinesswithus/downloads/lgr/reg_table_for_internet_31jan11.pdf for a list of roads classified as regional or State (local roads can be identified as those not appearing on the list).
- **May:** 'may' is used in this document to make *recommendations* of good practice.
- **Must:** 'must' is used in this document to give mandatory directives.
- **Near miss:** a failure by a safety management measure that does not result in a crash. In the operation of a railway crossing, the Independent Transport Safety Regulator defines a near miss as "Any occurrence where the driver of a moving train takes emergency action, or would have if there was sufficient time, to avoid impact with a person, vehicle or other obstruction, and no collision occurred. Emergency action includes continuous audible warning and/or brake application."

Source: www.rsrp.asn.au/files/publications/12_30..pdf

- **Operational issues:** events or potential events that may impact upon the safe and efficient movement of road or rail traffic.
- **Over Size Over Mass:** a category of heavy vehicle which includes vehicles that, either on their own or with their loads included, exceed a relevant mass or dimension limit of the *Road Transport (Vehicle Registration) Regulation 2007* or *Road Transport (Mass, Loading and Access) Regulation 2005*. Examples include special purpose vehicles (eg, mobile cranes), vehicles carrying an indivisible load (eg, a wind power generator blade), and agricultural vehicles (eg, tractors and airseeders). In such cases, authority to travel is provided by a vehicle permit system (see www.rta.nsw.gov.au/heavyvehicles/oversizeovermass/index.html or www.rta.nsw.gov.au/heavyvehicles/downloads/operating_conditions-oversize_overmass.pdf).
- **Passive control:** controls the movement of vehicular or pedestrian traffic across a railway crossing using signs or devices which rely on the road user detecting the approach or presence of a train by direct observation. In other words, in passive control the signs and devices are not activated during the approach or passage of a train. For definitions of crossing control types see page 15 of ITSR www.rsrp.asn.au/files/publications/12_30.pdf.
- **Person:** refers to a natural person, or a company, partnership, joint venture, the association or corporation of another body corporate, or any governmental authority.
- **Planner:** the officer responsible for the planning and management of a safety management plan at a railway crossing. The planner is normally appointed by the directorate delegated to deliver the project on behalf of the project sponsor; but in some cases the planner is appointed by the project sponsor.
- **Policy Manager, Road User Priority and Access:** the position responsible for the policy, strategy and program management of railway crossings in the RTA's Traffic Management Branch, Network Services Directorate.
- **Post-incident management measure:** any measure which aims to:
 - Limit the severity of an incident (crash) once it has occurred.
 - Reduce the likelihood of consequences (that is, injuries and fatalities to road and rail users) of that incident.
 - Reduce the likelihood of a secondary incident occurring (that is, a subsequent crash) as a result of the initial incident.
 - Reduce the likelihood of consequences occurring as a result of a secondary incident, should it occur.
- **Project Manager (railway crossings):** the RTA's Infrastructure Services, Road Safety and Traffic Management section officer responsible for the day-to-day management of railway crossings in their region.
- **Public road:** any road that is opened or dedicated as a public road, whether under the *Roads Act 1993* or any other law; and any road that is declared to be a public road for the purposes of the *Roads Act 1993* but does not include a Crown road.
- **Rail infrastructure manager:** the person who has effective management and control of the rail infrastructure of a railway, whether or not the person owns the rail infrastructure, or has a statutory or contractual right to use the rail infrastructure or to control and/or provide, access to it. In NSW rail infrastructure managers include:
 - The Australian Rail Track Corporation (ARTC).
 - The Rail Corporation New South Wales (RailCorp).
 - The Country Rail Infrastructure Authority (CRIA).
 - The Transport Infrastructure Development Corporation (TIDC).
 - Rail infrastructure managers of isolated lines and private sidings.
 (Source: Section 4 of the NSW *Rail Safety Act 2008*.)
- **Rail transport operator:** may be a rail infrastructure manager, or a rolling stock (train) operator, or a person who is both (NSW *Rail Safety Act 2008*). Typically, the term 'rail transport operator' is used to refer to any person who operates rolling stock on the railway.
- **Rail reserve:** the land dedicated for the operation of a railway.

- **Railway:** a guided system designed for the movement of rolling stock, which has the capability to transport passengers or freight on a railway track together with its infrastructure and rolling stock.
- **Railway crossing:** the area where a road and a railway cross at substantially the same level. This includes the land, features and infrastructure bounded by the rail reserve and prolongation of the road boundary.
- **Railway crossing area of influence:** in the roads authority context, this includes the railway crossing and an agreed distance along the approach roads that are considered to be essential to ensure the safe operation of both the railway crossing and the traffic which is affected by the operation of the railway crossing. The length of road agreed upon typically relates to the provision of traffic control devices such as warning signs. However, the area of influence may extend further along the road, as the length of vehicle queues may influence road safety further than the warning signs. For instance, a crash at the back of the queue of traffic might be associated with the operation of the railway crossing.
- **Railway crossing GIS database:** a spatial database used to store information regarding railway crossings. Among its uses is the mapping of railway crossings with other spatial information such as road crashes. This database is managed by the RTA's Road Information and Asset Management Technology section.
- **RC:** railway crossing.
- **RC Risk Register:** a list of those sites where risk is deemed to be above a 'broadly acceptable' level. These sites are prioritised for treatment when funds are available. The register is held by the Policy Manager, Road User Priority and Access, Traffic Management Branch. See also the glossary entry for 'broadly acceptable'.
- **Recovery measure:** another term for a post-incident management measure.
- **Regional road:** an administrative category for roads in New South Wales. Regional roads are roads under the care and control of local governments, with funding provided by local government and supplemented by the RTA under the 'block grant agreement'. For information on the block grant agreement see www.rta.nsw.gov.au/doingbusinesswithus/lgr/index.html. For a list of classified roads, including their administrative category, see www.rta.nsw.gov.au/doingbusinesswithus/downloads/lgr/reg_table_for_internet_31jan11.pdf.
- **RAV:** Restricted Access Vehicle. A vehicle that is larger than a general access vehicle, as defined in the *Road Transport (Mass, Loading and Access) Regulation 2005*. These vehicles are restricted to travel on specified (gazetted) routes in New South Wales. Common configurations include B Double and Road Trains. See also the glossary entry for 'Over Size Over Mass Vehicle' for another category of vehicle/load that is larger than the general access limits.
- **Risk:** the chance of something happening that will have an impact on RTA road safety objectives. A risk is:
 - Often specified in terms of an event or circumstance and the consequence that may flow from it.
 - Measured in terms of a combination of the consequences, their likelihood and exposure.
- **Risk analysis:** the assessment of the risks presented by an RC in terms of the likelihood and consequences of incidents that might arise from these risks, taking into account the existing safety management measures at that railway crossing.
- **Risk assessment:** the overall process of identifying, analysing and evaluating risks, hazards and hazardous events at a railway crossing. See also the glossary entries for 'risk analysis' and 'risk evaluation'.
- **Risk assessment criteria:** standards for the comparison and evaluation of risks at railway crossings. See *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*, Section 5, for a discussion of these criteria.
- **Risk assessment procedure:** a five-step procedure used to identify, assess, evaluate and manage safety risks and safety management measures at railway crossings. This five step procedure is detailed in Appendix A of *Plan: Establishing a railway crossing safety management plan*.
- **Risk category:** a way in which risks at a railway crossing are grouped according to the different types of road user behaviour from which they arise. See *Evaluate: Applying the railway crossing cause consequence bow tie models*, Section 2.1.

- **Risk control:** the part of risk management that involves the implementation of policies, standards, procedures and physical changes to eliminate or minimise adverse risks (AS 4360).
- **Risk evaluation:** the process of comparing the existing level of risk at a railway crossing with the new level of risk that would eventuate from the implementation of changes to risk management, should any be deemed necessary, arising from the risk analysis process. Risk evaluation therefore often involves a comparison of the effects of existing safety management measures with the effects of revisions to the existing safety management measures. Often a number of alternative revisions are considered during risk evaluation.
- **Risk level:** a qualitative measure that brings together the likelihood and consequence of a risk, on a scale from Negligible to Extreme, to allow the ranking of risks and the prioritising of mitigation or safety management measures where the level of risk is above the 'broadly acceptable' threshold. See also the glossary entry for 'broadly acceptable'.
- **Risk level:** this is determined taking into account the risk assessment criteria of likelihood and consequence, and assigned through use of the risk level matrix. See *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*, Section 5.
- **Risk level matrix:** a matrix which uses the risk assessment criteria as they apply to a particular railway crossing to generate a risk level for that particular risk. See *Assess: Applying risk tolerance and risk assessment criteria to railway crossings*, Section 5.5.
- **Risk management:** an overall process of hazard identification, risk assessment and risk management, which includes the implementation, and active monitoring and review, of controls, policies, procedures and practises, to manage those risks, so that they are maintained at a level that is as low as is reasonably practicable.
- **Risk ranking:** An output of ALCAM which sorts the relative safety of public railway crossings throughout NSW from greatest risk to lowest. A railway crossing ranked 'one' is judged to have the highest risk.
- **Risk rating:** the overall risk level of a railway crossing.
- **Risk tolerance:** the amount of risk that the RTA is prepared to accept, tolerate, or be exposed to, before it judges that action is necessary to reduce or eliminate that risk. Decisions regarding risk tolerance take into account all the risks to the RTA in the context of exhaustible resources. Risk tolerance is a function of ranking a risk against all other assessed risks and determining at what risk level risk mitigation action should be taken, SFAIRP. For the purposes of railway crossing risk assessments, levels of Negligible and Low are considered to be broadly acceptable.
- **Risk type:** a way in which risks at a railway crossing are grouped which takes into consideration both road user behaviour and the control, design and operational elements at a railway crossing. Risk types are organised as sub-categories of risk categories. See *Evaluate: Applying the railway crossing cause consequence bow tie models*, Section 2.1.
- **Road carriageway:** the portion of a road or a bridge devoted particularly to the use of vehicles, inclusive of shoulders and auxiliary lanes (*Austroroads Glossary of Terms 2010*).
- **Road project:** a project funded or commissioned by the RTA that results in a new road or new traffic management infrastructure, or a physical change to the infrastructure of an existing road which, subsequent to this change, will become part of the State road network in NSW. Examples of road projects include:
 - A new motorway or improvement to an existing motorway.
 - A new arterial road or an upgrade to an existing freeway or arterial road, including road widening, traffic control signals, intelligent transport systems and traffic control facilities.
 - An enhancement to the road-based public transport network, such as a transitway or bus priority measure on an existing freeway or arterial road.
- **Road Safety Audit policy:** released as a Technical Direction by the NSW Centre for Road Safety TD 2003/RS03, Version 2 in August 2005. This provides an imperative to conduct road safety audits. See www.rta.nsw.gov.au/roadsafety/downloads/tds/td2003rs03-aug05.pdf.

- **Road Safety Audit process:** a formal examination of an existing road, or a future road or traffic project, in which an independent qualified team looks at the project's potential crash and safety performance. The process may be applied to an existing road network, to concept or detail designs prior to road construction, during road construction or before opening the road to traffic.
- **Road:** a private road or a public road that has, as one of its main uses, the driving or riding of motor vehicles, and includes any relevant road-related area within the meaning of the *NSW Road Rules 2008*.
- **Road user:** a driver, rider, passenger or pedestrian (*NSW Road Rules 2008*).
- **RTA:** the Roads and Traffic Authority of New South Wales.
- **Safe systems approach:** an approach that provides for safety to be considered throughout all phases of a road project, as all phases can be seen as contributing to the provision of a safer system. For example, a safe systems approach to a road project would include the following: designing the road, roadside areas and traffic management measures to provide a forgiving environment for all road users (safer roads); public education (safer people); and, vehicle safety standards (safer vehicles).
- **Safety control measure:** an alternative term for a safety management measure. See also the glossary entry for 'safety management measure'.
- **Safety management measure:** any measure (including legal measures, physical actions, engineering measures, educational measures and so on) that aims to prevent or mitigate an incident.
- **Safety management plan:** a railway crossing safety management plan is a contract between the RTA and other relevant parties which details how safety risks, safety management measures and post-incident management measures will be managed at a railway crossing, so far as is reasonably practicable.
- **Safety risk:** another term for 'risk'. See also the glossary entry for 'risk'.
- **SFAIRP:** see the glossary entry for 'so far as is reasonably practicable.'
- **Shall:** 'shall' is used in this document to give mandatory directives.
- **Should:** 'should' is used in this document to make *recommendations* of good practice.
- **So far as is reasonably practicable:** what is (or was at a particular time) reasonably practicable in relation to ensuring safety with regard to risk, taking into account:
 - The likelihood of a risk eventuating.
 - The degree of harm that would result if a risk eventuated.
 - What the person concerned knows, or ought reasonably to know, about a risk and any ways of eliminating or reducing a risk.
 - The availability and suitability of ways to eliminate or reduce risk.
 - The cost of reducing or eliminating a risk.

(Source: Section 6 (2), *NSW Rail Safety Act 2008*)

- **State road:** an administrative category for roads in NSW. The RTA takes responsibility for managing the primary traffic function of State roads, including funding and determining priorities. The RTA also regulates the activities of third parties – including local councils and contractors – on the road. This is to ensure that road safety and traffic efficiency are promoted and consistently applied across the major traffic routes throughout the State, and that the road asset is protected. Activities that are located outside of the primary traffic area do not relate to traffic control, such as footpaths, are generally the responsibility of local councils. See www.rta.nsw.gov.au/doingbusinesswithus/downloads/lgr/reg_table_for_internet_31jan11.pdf for a list of roads classified as State roads.
- **Unincorporated area:** the area in the far west of NSW that does not have a local government. The *Western Lands Act 1901* established the position of the Western Lands Commissioner who is responsible for administering the Act, subject to the control and direction of the Minister for Lands. The Unincorporated Area is managed by the NSW Department of Lands under direction of the Western Lands Commissioner. See www.edo.org.au/edonsw/site/factsh/fs02_6.php.

This document is part of the Railway Crossing Safety Series 2011, the documents that make up the series are:

- Plan: Establishing a railway crossing safety management plan (*policy number PN239G*)
- Identify: The railway crossing safety hazard checklist (*policy number PN241G*)
- Assess: Applying risk tolerance and risk assessment criteria to railway crossings (*policy number PN238G*)
- Evaluate: Applying the railway crossing cause consequence bow tie models (*policy number PN240G*)

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