onrsr Office of the National Rail Safety Regulator

ONRSR CODE OF PRACTICE

TRAIN VISIBILITY AT LEVEL CROSSINGS

Published LW 6 December 2024 (2024 No 620)

SAFE RAILWAYS FOR AUSTRALIA

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FOREWORD

The Rail Safety *Code of Practice – Train Visibility at Level Crossings* (the code) has been produced by the Office of the National Rail Safety Regulator (ONRSR).

An approved code of practice under the *Rail Safety National Law 2012* (RSNL) provides a shared understanding of risk, and practical guidance on how to achieve compliance with the law.

There are more than 23,000 level crossings nationally and all of them present a degree of risk to safety. Other than suicide and trespass, collisions at level crossings are the primary cause of rail-related fatalities among the public.

Throughout 2022 and 2023 ONRSR directed its efforts to facilitating the delivery of important research to improve awareness and visibility of trains approaching level crossings as part of a continuing focus on safety at regional level crossings.

In June 2023 Infrastructure and Transport Ministers committed to improving level crossing safety across Australia by improving illumination of trains approaching level crossings.

A Code of Practice was seen as the best mechanism to ensure a structured approach for rail and road entities to apply to achieve improved illumination of trains approaching level crossings.

Data on collisions and near-hits at level crossings shows that the majority occur in daylight (74% of collisions and 81% of near-hits).

Given this data, the scope of the code is extended beyond train illumination to address a wider range of visibility hazards that can impact a road user's ability to safely use a level crossing.

The code puts an emphasis on improving train visibility within the broader objective of improving safety at level crossings. Train visibility at level crossings requires a multifaceted approach to risk management for the identification, assessment, and selection of controls to manage risks arising from interactions between trains and road users at level crossings.

The code incorporates both common and additional complementary controls that promote awareness and visibility of trains approaching level crossings to further manage and mitigate the risk of collision.

To improve train visibility beyond illumination requires consideration of a range of risk factors such as sight lines, signage, and human factors considerations which impact road user compliance with road rules whether intentionally or by mistake.

A multifaceted approach to train visibility at level crossings is more likely to draw out a wider selection of controls to support road and rail entities to manage and mitigate the risk to road and rail users at level crossings.

The code was developed in consultation with a range of stakeholders including rail industry representatives, unions, governments, those with lived experience of rail collisions, transport industry representatives, researchers, and subject matter experts.

The code incorporates both common and additional complementary controls that promote awareness and visibility of trains approaching level crossings to further manage and mitigate the risk of collision.

1. PURPOSE

The purpose of the *Code of Practice –Train Visibility at Level Crossings* (the code) is to provide a means of complying with the duty to manage, so far as is reasonably practicable, the safety of rail and road users at level crossings where interactions occur between trains and road users. It is also intended to provide a nationally consistent way forward for improved road user awareness of level crossings and visibility of trains using these crossings.

In outlining a risk management approach, the code:

i. provides rail transport operators (rolling stock operators and rail infrastructure managers) and road managers with an understanding of the expected approach to improving train visibility at level crossings, and

ii. provides an understanding of the expectations arising from the use of common safety control measures available to manage the risk arising from the interaction between trains and road users at level crossings, and

iii. promotes a collaborative approach between rail transport operators and road managers to ensure, so far as is reasonably practicable, that road users are afforded the best opportunity to safely cross a level crossing.

The code focuses on improving train visibility at level crossings taking into consideration the different risks and hazards that contribute to a road user not being able to see a train on approach to a level crossing.

Rail transport operators, both rail infrastructure managers and rolling stock operators, along with road managers have a responsibility to ensure, so far as is reasonably practicable, that road users are afforded the best opportunity to safely cross a level crossing.

The code requires rail transport operators to conduct a risk assessment, and liaise with other rail transport operators and road managers to implement controls and treatments to manage risks so far as reasonably practicable with a focus on train visibility including:

- level crossing protection controls
- traffic control devices
- lines of sight
- train conspicuity.

An overview of an expected risk management framework for level crossing related risks, of which this code anticipates is being applied by the relevant level crossing interface risk managers, can be found in Appendix A.

Definitions of terms and abbreviations used in this code are provided in section 11.

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2. SCOPE

The code is for use by rail transport operators, as safety duty holders under the *Rail Safety National Law* (RSNL).

It has application to road managers, who are not RSNL duty holders but have RSNL responsibilities as key level crossing management partners across Australia.

Effective cooperative and coordinated management by rail transport operators and road managers is essential to underpin the shared responsibility to manage risks to safety at level crossings.

The code focuses on train visibility at public road level crossings as the primary form of level crossings that are typically encountered and used by road users. However, the principles set out in the code may have application to less formalised level crossings that exist with private roads, within railway yards and sidings, unfenced rail corridors or shared use areas that are accessible by the public.

The standards referenced in the code are intended to be used as a minimum. Furthermore, Australian Standard *AS7531 – Rolling stock lighting and visibility* (AS7531) is also to apply to existing rolling stock as outlined in section 10.3.

This code should be used alongside the RSNL and National Regulations and the relevant state and territory work health and safety (WHS) laws.

2.1. OUT OF SCOPE

Out of scope of this code is the enforcement of road user behaviour at or around level crossings.

3. APPROVED CODES OF PRACTICE AND THE RAIL SAFETY NATIONAL LAW

An approved code of practice under the RSNL is intended to provide a common understanding of risks of the specific subject matter and provide a practical approach on how to achieve compliance with the law, including the general duty to manage, so far as is reasonably practicable, risk to safety.

This code of practice references standards, some of which apply a minimum risk control approach for level crossings. Depending on the risk assessment, the management of risk so far as is reasonably practicable may require a higher control or level of mitigation than applies in the standard.

Compliance with a code of practice is not mandatory provided a rail transport operator has an alternative policy or solution with the same or better control measures, or they can show a recommended control is not reasonably practicable for their operations.

Codes of practice deal with particular issues and do not cover all hazards or risks which may arise. The RSNL requires duty holders to consider all risks associated with their rail operations not only those for which regulations and codes of practice exist.

Adoption of an approved code of practice is a positive way in which to meet legal requirements and to discharge general safety duty obligations, having the objective of protecting rail safety workers and the public from harm.

As per section 250 of the RSNL in the case of proceedings, a code may be used as evidence of what should be known about the risk the code is addressing and the nature of controls that should be in place.

4. EXISTING CONTROLS

The risk of collision at level crossings presents one of the highest risks to safety with the potential for serious or fatal consequences to road and rail users.

Where grade separation of level crossings is not achievable and they remain at grade, safety at level crossings is primarily governed by traffic control devices and the established laws, which principally require that road users must give way to trains. This is because trains cannot quickly stop or veer away from a level crossing. The give way principle is established through the model Australian Road Rules and adopted and applied by each State and Territory's road traffic legislation (herein referred to as the road rules). Road user behaviour is therefore a critical control for managing safety at level crossings.

The application of consistent and standard level crossing traffic controls set out in *Australian Standard AS1742.7 – Manual of Uniform Traffic Control Devices – Railway Crossings (AS1742.7)* ensures road users are presented with familiar traffic control devices.

The road rules establish the requirements expected of road users to safely cross level crossings. Driver licensing authorities in each state and territory provide a range of driver training, education, and guidance, to educate and influence the expected behaviours of road users in line with the road rules.

In response, road users expect to be presented with common and consistent warning, control and sighting treatments at level crossings aligned with the information they have received through the driver licensing process, or through material published by state governments such as those relating to pedestrians and cyclists. Rail transport operators expect road users to comply with the road rules to safely use level crossings.

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5. THE HAZARD/RISK

Despite the existence of common and consistent traffic control devices at level crossings and the expected behaviour of road users in line with the road rules, the risk of collisions at level crossings remains.

To ensure road users can make the decision and act to give way to trains, they must be provided with sufficient awareness and visibility of a level crossing and of approaching trains. This includes clear warning of and/or the ability to observe the approach or presence of a train they need to give way to when at a level crossing.

Additionally, road users need a variety of visual information to assist them to cross a level crossing safely. For example, to assess the speed of, and distance to, the approaching train in order to respond appropriately.

Furthermore, given the limits of human performance and understanding that not all road users are holders of driver's licences (e.g. school aged children), rail transport operators and road managers may need to be aware of and consider such information to assist them to understand and address road user behaviour that may not meet the expectations set out under the road rules.

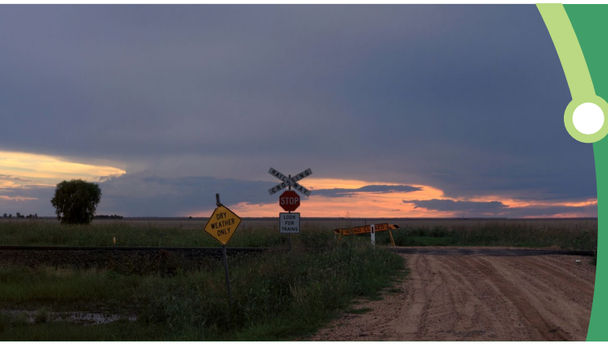
Non-compliance with the road rules at level crossings by road users may stem from a multiplicity of reasons as understood from human factors considerations.

For example, road users crossing level crossings in an unsafe manner may be the result of human factors issues including:

- not looking for a train
- not noticing warnings or trains due to distraction (e.g. phone users)
- expecting (or not) to see a train because of past experience
- not noticing obvious, but unexpected, warnings or trains due to inattention
- not recognising the level crossing
- misjudging the speed and distance of the train
- looking but not registering what they have seen
- expecting there to be built-in tolerance for error
- fatigue
- speed.

Understanding the unique features and environment of a level crossing along with the level of non/compliance by road users will better inform the selection of control measures (treatments) needed to support road users to safely cross level crossings at different locations.

As required by the level crossing interface management provisions of the RSNL, the selection of the appropriate level crossing treatments to support the desired behaviour of road users must be jointly undertaken by the relevant rail infrastructure manager and road manager.



To ensure road users can make the decision and act to give way to trains, they must be provided with sufficient awareness and visibility of a level crossing and of approaching trains.

The RSNL principle of shared responsibility for rail safety means that rail transport operators must continue to apply a risk assessment process, including maintaining important engagement and cooperation with road managers, and monitor and manage the risk of controls at level crossings being made ineffective due to:

- deterioration of the traffic control devices used to warn and control road users; or
- the traffic control devices and/or trains using the level crossing being visually obscured; or
- trains approaching, entering or using the interface not being easily sighted by the road user; or
- inconsistent presentation or application of traffic control standards.

Other considerations include but are not limited to:

- insufficient advanced warning traffic control devices
- lines of sight on approaching road and in rail corridor being obstructed
- train not being conspicuous (i.e. lighting, livery, reflectivity, and cleanliness)
- train driver not sounding the horn and/or activating visibility lights
- level crossing lights not activating properly
- changes to the use of the rail infrastructure (i.e. faster trains, an additional track etc)
- changes to adjacent roads (e.g. increased traffic volumes, upgraded road or intersection)
- level crossing not meeting standards
- level crossing has not been risk assessed or treated properly.

It is all these areas of risk to safety, including human factors considerations against these hazards, that the code directly addresses.

Visibility requirements and the hazards that impact visibility such as line of sight, traffic control devices and train conspicuity are similar but not the same. Sections 8, 9 and 10 each provide guidance on mitigations to these risks. In some cases, the same mitigation can address multiple risks. For that reason, there is some repetition across the three sections. However, this does allow for the requirements to be known if a section is read in isolation.

6. APPLICATION

The code provides commentary on the common risks that should be known and considered in the management of safety at level crossings in the context of a road user's ability to see an approaching train and to take the action they are required to take to safely cross a level crossing. The code provides expectations on how to manage such risks to safety, relating to train and traffic control device visibility at a level crossing, so far as is reasonably practicable.

Users of the code must consider additional risks and controls where level crossings have unique features or environments that may impede road users' visibility and awareness of trains approaching level crossings.

For example, where there is insufficient lighting, livery, reflectivity or cleanliness of the train for the road user at the level crossing to be made aware of and/or see the approaching train and to be able to respond within the timeframe needed to avoid a collision.

To comply with the code, rolling stock operators must assess and document whether additional lighting, beyond what is recommended in *Australian Standard AS7531 – Rolling stock lighting and visibility (AS7531)* on their locomotives or along the train consist is required to ensure, so far as is reasonably practicable, that road users will be made aware of and/or are able to see approaching trains at level crossings which form part of their rail operations.

Reasons for deviating from AS7531 or, for or against additional lighting requires documentation as part of the risk assessment process along with the supporting evidence to justify the decision.

The code complements and should be applied in the context of the requirement to manage risks to safety under section 99 and the requirements of subdivision 2 – interface agreements, of the RSNL, to manage shared interface risks.

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6.1. LEVEL CROSSING SAFETY MANAGEMENT RESPONSIBILITIES

Managing risks to safety at level crossings is the shared responsibility of rolling stock operators, rail infrastructure managers, and road managers.

The RSNL sets requirements on the establishment of interface agreements between rolling stock operators, rail infrastructure managers and road managers to manage risks to safety at road and rail interfaces. While the road rules establish the requirements or rules for road users to follow to safely cross a level crossing.

Under section 106 of the RSNL, rail transport operators must:

- identify and assess so far as is reasonably practicable, the safety risk arising from their operations and those of other rail transport operators
- determine the measures, so far as is reasonably practicable, to control the risk and
- seek to enter into an interface agreement with the interfacing party(s).

Under section 107 of the RSNL, rail infrastructure managers and road managers must for a public road:

- identify and assess so far as is reasonably practicable, the safety risk arising from their operations and those of the interfacing rail infrastructure manager or road manager
- determine the measures, so far as is reasonably practicable, to control the risk and
- seek to enter into an interface agreement with the interfacing party(s).

Interface agreements between road managers and rail infrastructure managers are separate to those between rail infrastructure managers and rolling stock operators. Further information on interface agreements is available on the ONRSR website.

Key risk control relationships for train visibility controls are between:

road managers and rail infrastructure managers for controls relating to better sighting along the rail and road corridors; and

rolling stock operators and rail infrastructure managers for controls relating to better visibility of trains through illumination and conspicuity.

In keeping with the RSNL principles for shared risk management responsibilities and in the context of visibility requirements, responsibilities for management of level crossing safety typically* include:

- rail infrastructure managers are responsible for the provision of active protection or, at a passive level crossing, signage at the crossing and maintaining the line of sight along the rail corridor such as removal of vegetation.
- road managers are responsible for the provision of advance warning and pavement markings along with other devices and activities that maintain the line of sight along the roadway on the approach to the level crossing, relevant traffic control devices and, in some cases, provision of lighting at or adjacent to the crossing and level crossing controls.
- rolling stock operators are responsible for the livery, presentation and conspicuity of rolling stock forming a train which provide contrast against the natural environment so the train may be seen, horns heard or activated lights in place to improve awareness and visibility of approaching trains.

**some of these responsibilities may vary under different state legislation.*

Road managers of private level crossings are only required to enter into an interface agreement under section 108 of the RSNL if the rail infrastructure manager determines that risks to safety must be managed in conjunction with the road manager.

The code assumes the general allocation of joint responsibility set out above. Additional arrangements can be entered into to adopt specific responsibilities and arrangements through interface agreements to manage safety so far as is reasonably practicable.

Joint responsibility allows and encourages any stakeholder to be proactive and collaborative. Any party who notices a safety issue should report it to the appropriate authority, even if it is not their direct and legal responsibility.

7. VISIBILITY REQUIREMENTS – LEVEL CROSSING PROTECTION CONTROLS

The selection process for the combination of traffic control devices required for level crossing protection (in accordance with AS1742.7) is, in part, governed by sighting opportunities at level crossing locations along with traffic volume, complexity of the road and rail environment and traffic mix more broadly.

Furthermore, understanding human factors considerations as outlined in section 5 and their impact on human behaviour especially at level crossings may further influence the selection of treatments used to control risks to safety at level crossings.

Tables 1 and 2 on the following pages outline the responsibilities on and expectations of drivers and pedestrians when they are approaching common types of level crossing traffic controls as set out in the road rules.

Rail infrastructure managers and road managers should use these tables along with human factors considerations to inform their risk assessments when specifically considering driver behaviour at level crossings and selecting the appropriate level of protection for a level crossing.

Having determined the type of level crossing protection required, i.e. the traffic control devices necessary to manage the risk to safety at the level crossing, their effectiveness will depend on road users being aware of or able to see them and responding to them as expected.

To comply with the code, Table 3 sets out the additional controls such as line of sight and train conspicuity (make the train more visible or aware to road users) that must be in place at level crossing across Australia to ensure trains or installed traffic control devices at level crossings are seen or apparent to road users.

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Table 1 – Driver Responsibilities and Expectations at Common Level Crossing Traffic Controls

Common Traffic Controls (Protection Type)	Driver responsibilities and expectations when approaching common traffic controls at level crossings
Give Way Sign (Passive Control) *Model Australian Road Rules 122 and 123.*	**Purpose:** In conjunction with any advance warning signs or devices required by AS1742.7, this treatment signals to road users the need to slow down, look for trains and be prepared to stop (at the Give Way line) and give way to a train approaching or on a level crossing. Sets the expectation that drivers will begin slowing to be able to stop at the Give Way sign (or Give Way line) while looking for trains and determining the need to stop. **Driver responsibilities:** Drivers are required to stop and give way to any train approaching or on the level crossing. If there isn't a train, then the road user can continue across the level crossing without stopping if it is safe to do so. Drivers should approach a level crossing Give Way sign in the same manner as a Give Way at a road intersection. That is, they are slowing, looking, and preparing to stop, regardless of the need to stop. **Driver expectations and behaviour:** Drivers expect to have clear vision along the rail corridor on the road approaching the level crossing to determine the right course of action i.e. stop and give way or continue through the level crossing. Drivers may not always slow down while initially looking for a train or may wait until a train is sighted as the trigger to slow down. Drivers also expect the conditions of the road surface as well as the gradient of the road approaching and departing the level crossing to be suitable for vehicles that are permitted to use the crossing.
Stop Sign (Passive Control) *Model Australian Road Rules 121 and 123.*	**Purpose:** In conjunction with any advance warning signs or devices required by AS1742.7 this treatment signals to road users the need to stop at the Stop Sign (or Stop line). **Driver responsibilities:** Once stopped, a driver is expected to look for trains approaching, entering or on the crossing and is required to give way (remain stopped) to the train. It is expected that only when the driver decides that there is no danger of collision with a train that the driver can continue safely. **Driver expectations and behaviour:** Having stopped at the Stop Sign, drivers expect to have clear vision along the railway corridor to enable them to detect approaching trains and for such trains to be readily visible. Drivers rely on their own judgement to decide if it is safe to cross the railway based on their assessment of a train's distance from and approach speed to the level crossing. Drivers also expect the conditions of the road surface as well as the gradient of the road approaching and departing the level crossing to be suitable for vehicles that are permitted to use the crossing.

Table 1 cont.

Common Traffic Controls (Protection Type)	Driver responsibilities and expectations when approaching common traffic controls at level crossings
Flashing lights with or without boom gates (Active Control) *Model Australian Road Rule 123.*	**Purpose:** In conjunction with any advance warning signs or devices required by AS1742.7 this treatment signals to drivers that a train is approaching the level crossing. Active level crossing devices are either on or off and so do not have a warning/stop phase like traffic lights. In the case of flashing lights without boom gates, road users may not see a train entering or on the crossing in time to stop. **Driver responsibilities:** When lights are flashing drivers are expected to stop at the flashing light assembly or Stop line until the flashing lights have extinguished. **Driver expectations and behaviour:** When lights are not flashing a driver will expect to continue at a safe road speed across the crossing without any need to look for trains. Drivers expect there is sufficient time to cross safely if flashing lights commence as they pass the lights and may even adjust their speed to reduce any perceived error margin. Drivers do not expect to have to look for trains but expect they can rely on the active crossing control for direction on the need to stop or continue safely. Drivers also expect the conditions of the road surface as well as the gradient of the road approaching and departing the level crossing to be suitable for vehicles that are permitted to use the crossing.
Level crossing gates - automated or manual (Active Control)	**Purpose:** In conjunction with any advance warning signs or devices required by AS1742.7 this treatment signals to the road user that they are approaching a set of gates at a level crossing (not commonly used) are expected to slow and prepare to stop at the gates. Where the gates are open a driver expects to be able to safely proceed without the need to look for trains. **Driver responsibilities:** Where the gates are closed, or closing, drivers are expected to stop at the gate until they re-open. **Driver expectations and behaviour:** Drivers are not expecting to have to look for trains, instead they rely on the gate position for direction on the need to stop or continue. Drivers also expect the conditions of the road surface as well as the gradient of the road approaching and departing the level crossing to be suitable for vehicles that are permitted to use the crossing.

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Table 1 cont.

Common Traffic Controls (Protection Type)	Driver responsibilities and expectations when approaching common traffic controls at level crossings
Road traffic controller (Manual Control)	**Purpose:** The need to manually control the movement of road users at level crossings may arise from road or rail works, or to facilitate a unique rail movement not effectively controlled by the existing level crossing protection. Manually controlling a crossing will typically be undertaken by a person performing the function of a traffic controller. **Driver responsibilities:** Road traffic controllers expect drivers having been warned, will slow and prepare to stop on the road traffic controller's direction (typically by displaying a Stop or Slow (proceed) sign) and only proceed when signalled by the road traffic controller to do so. **Driver expectations and behaviour:** Drivers expect a warning they are approaching a traffic controller. The warning is typically provided by traffic control devices and the actions taken by the traffic controller should comply with *AS1742.3 – Manual of Uniform Traffic Control Devices – Traffic* control for works on roads. When near or at a level crossing, particularly a passive level crossing, drivers expect the traffic controller has confirmed and will indicate when it is safe to cross. Drivers do not expect it is necessary to look for trains themselves.

Table 2 – Pedestrian Responsibilities and Expectations at Common Level Crossing Traffic Controls

Common Traffic Controls (Protection Type)	Pedestrian responsibilities and expectations when approaching common traffic controls at level crossings
Give Way or Stop Sign at level crossing (Passive Control) Passive or no pedestrian level crossing facility at the crossing *Model Australian Road Rule 235.*	**Purpose:** Sets the expectation that pedestrians will be able to stop at a safe distance from the railway line while looking for trains and determining when it is safe to cross. **Pedestrian responsibilities:** Pedestrians must not cross a railway line at a level crossing unless there is a pedestrian facility at the crossing and the pedestrian uses the facility or there is no pedestrian facility at, or within 20 metres of the crossing. Where there are no active controls at the level crossing a pedestrian must not cross a railway line at a level crossing if a train is entering the crossing or a train approaching the crossing can be seen from the crossing or is sounding a warning and there would be a danger of the pedestrian being struck by the train if they entered the crossing. **Pedestrian expectations and behaviour:** Pedestrians expect to have clear vision along the rail corridor without obstructions such as overgrown vegetation or curvature of the railway line to determine when it is safe to cross the railway line. Where a pedestrian facility incorporates a pedestrian maze, the design is intended to cause pedestrians to face each way along the railway line before crossing. Pedestrians expect the sighting and sight distances needed to make a safe decision to cross are provided from the locations in the pedestrian maze that they are intended to look.

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Table 2 cont.

Common Traffic Controls (Protection Type)	Pedestrian responsibilities and expectations when approaching common traffic controls at level crossings
Flashing lights with or without boom gates at level crossing (Active Control) Passive or no pedestrian level crossing facility at the crossing *Model Australian Road Rules 235.*	**Purpose:** Sets the expectation that pedestrians will be able to stop at a safe distance from the railway line and the active control will give an indication of when it is safe to cross. An active road level crossing may be in place as a control for sighting difficulties along the approach roadway or railway, in which cases a pedestrian may not be able to see a train approaching or entering the crossing. **Pedestrian responsibilities:** Pedestrians must not cross a railway line at a level crossing unless there is a pedestrian facility at the crossing and the pedestrian uses the facility or there is no pedestrian facility at, or within 20 metres of the crossing. A pedestrian must not cross a railway line at a level crossing if warning lights are flashing or warning bells are ringing or if a boom gate or barrier at the crossing is closed or is opening or closing. If such warning lights or bells activate after the pedestrian has started to cross the railway line, they must continue finishing crossing without delay. **Pedestrian expectations and behaviour:** Pedestrians will not expect to have to look for trains as they approach the crossing with the intention to cross. They will expect to rely on the active road crossing control for direction on the need to stop or ability to continue to cross safely. Pedestrians will also expect there will be sufficient time to cross safely if the flashing lights activate as they enter or are on the level crossing. At crossings where there are multiple tracks, pedestrians may not always be aware that more than one train may use the crossing during the same activation period.
Pedestrian level crossing that has red pedestrian light (Active Control) *Model Australian Road Rule 235A.*	**Purpose:** Sets the expectation that pedestrians will be able to stop at a safe distance from the railway line while and the active control will determine when it is safe to cross. Active pedestrian level crossing facilities may be in place as a control for sighting difficulties along the railway, in which case a pedestrian may not be able to see a train approaching or entering the crossing. **Pedestrian responsibilities:** If a pedestrian approaches a pedestrian level crossing that has a red pedestrian light, the pedestrian must not start to cross the crossing while the light is red. If the red light appears after the pedestrian has started to cross the railway line, they must finish crossing without delay. **Pedestrian expectations and behaviour:** Pedestrians do not expect to have to look for trains. Pedestrians expect they can rely on the active crossing control for direction on the need to stop or continue safely. Pedestrians expect there will be sufficient time to cross safely if the red pedestrian light commences as they enter the level crossing.

Table 2 cont.

Common Traffic Controls (Protection Type)	Pedestrian responsibilities and expectations when approaching common traffic controls at level crossings
Passive pedestrian crossing not at road level crossing e.g. pedestrian maze	**Purpose:** Sets the expectation that pedestrians will be able to stop at a safe distance from the railway line while looking for trains and determining when it is safe to cross. **Pedestrian responsibilities:** Where there are no active controls at the level crossing a pedestrian must not cross a railway line at a level crossing if a train is entering the crossing or a train approaching the crossing can be seen from the crossing or is sounding a warning and there would be a danger of the pedestrian being struck by the train if they entered the crossing. **Pedestrian expectations and behaviour:** Pedestrians expect to have clear vision along the rail corridor without obstructions such as overgrown vegetation or curvature of the railway line to determine when it is safe to cross the railway line. The design is intended to cause pedestrians to face each way along the railway line before crossing. Pedestrians expect the sighting and sight distances needed to make a safe decision to cross are provided from the locations in the pedestrian maze that they are intended to look.
Active pedestrian crossing not at a road level crossing e.g. gated with alarms and/or signals	**Purpose:** sets the expectation that pedestrians will be able to stop at a safe distance from the railway line and the active control will determine when it is safe to cross. Active pedestrian level crossing facilities may be in place as a control for sighting difficulties along the railway, in which case a pedestrian may not be able to see a train approaching or entering the crossing. **Pedestrian responsibilities:** A pedestrian must not cross at an active pedestrian crossing when gates are closed or when alarms and signals are activated. **Pedestrian expectations and behaviour:** Pedestrians do not expect to have to look for trains. They expect the can rely on the active crossing control for direction on the need to stop or continue safely. Pedestrians expect there will be sufficient time to cross safely if alarms and signals commence as they enter the level crossing.

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Table 3 – Level Crossing Protection Type – measures to improve visibility

	Level Crossing / Interface protection type					
Measures to improve visibility	Passive – Give Way & passive pedestrian crossing	Passive – Stop	Active (flashing lights only) & active lights only pedestrian crossing	Active (with boom gates) & active gated pedestrian crossing	Manually controlled (by traffic controller)	No control*
Advanced warning traffic control devices - visible and maintained.	Required.	Required.	Required.	Required.	Required.	
Crossing protection traffic control devices - present and maintained.	Required.	Required.	Required.	Required.	Required.	
Sight lines - established and maintained to enable visibility of traffic control devices.	Required.	Required.	Required.	Required.	Required.	
Sight lines - established and maintained to enable visibility of approaching trains.	Required.	Required.	Desirable.			Required.
Trains - visible and conspicuous, sufficient for the perceptual needs of road users.	Required.	Required.	Desirable.			Required.
Train conspicuity - managed and maintained for trains entering or on the interface.	Required.	Required.	Desirable.			Required.

**While it is not common, nor preferred, to have crossings without traffic controls, it does have application where public access provides a crossing opportunity (road and rail interface) and it is reasonable to expect people use it to cross railway tracks. For example, in publicly accessible areas of railway yards, along unfenced rail corridors within urban areas or within designated shared use areas.*

To comply with the code, the controls and requirements in Table 3 for improved visibility of installed traffic control devices including sight lines must be considered at a level crossing on a site-by-site basis.

Whereas, the requirements for train conspicuity controls (to make the train more visible or aware to road users) must be considered at a whole of railway, or railway network level taking into consideration the range of level crossing types that exist along the railway and the extent of train conspicuity required to ensure road users are afforded every opportunity to be made aware of and able to see a train approaching a level crossing.

For example, even for a railway with most level crossings under active protection controls, where train visibility and conspicuity may be less critical, the presence of one or more passive level crossings on that railway means that train conspicuity controls and requirements must be the same for all trains operating on the railway to ensure visibility at the passive level crossings.

Passenger or freight trains that are used frequently, at high speed and in poor light, may be recognised as needing greater risk controls. However, assessment and selection of the appropriate risk controls for crossings with low frequency of trains requires particular consideration given their over representation in level crossing incidents.

8. VISIBILITY REQUIREMENTS – TRAFFIC CONTROL DEVICES

Making a road user aware that they are approaching a level crossing and what action is required of them to reduce the risk of collision are important controls for achieving correct and safe behaviour to reduce the risk of fatal and serious injury or collision. Presenting information to enable this awareness and facilitate an appropriate response is the job of traffic control devices installed in advance and at level crossing sites (Tables 1, 2 and 3).

To comply with the code, hazards impacting the visibility of traffic control devices must be considered by the rail infrastructure manager and road manager when assessing the risk of road users' awareness of their approach to and knowing what to do at a level crossing. Such hazards include, but are not limited to:

- the curvature of the road impeding sighting of a traffic control device
- poor condition of, or missing, traffic control devices due to deterioration, damage or vandalism
- road traffic mix and volume that may limit visibility of approaching signs and pavement markings
- encroaching vegetation, including seasonal growth
- presence of other traffic control devices or roadside signs that may compete for a road user's attention or contribute to distraction on approach to the crossing
- presence of obsolete or superseded (non-standard) traffic control devices
- time of day impacts e.g., during sunrise or sunset (including sun glare)
- background environment clutter diminishing the prominence of the traffic control devices

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- use of temporary traffic control devices for road or rail works at or near a crossing that may conflict with the primary level crossing control and normal road user expectations
- weather and seasonal impacts.

Consideration should also be given to the different types of road users accessing a level crossing and their visibility requirements for traffic control devices, such as pedestrians including wheelchair users, light and heavy vehicle drivers, motorcyclists and cyclists.

8.1. APPLICABLE STANDARDS

AS1742.7 establishes technical standards for the selection and installation of traffic control devices at and on approach to level crossings.

Road managers, with the appropriate legal authority, may approve the use of altered or additional traffic control devices. This may occur to enhance the advanced warning of a crossing, integrate level crossing controls with interfacing road traffic controls (e.g., traffic lights), or to manage a site-specific traffic control requirement.

Australian standard *AS7658 Level crossings – rail industry requirements* (AS7658) provides rail transport operator with operational and engineering requirements for the management of level crossing risks, including requirements for the design, management and operation of level crossing controls (traffic control devices) to complement AS1742.7.

8.2. REQUIRED RISK CONTROLS

To comply with the code, rail infrastructure managers and road managers that manage one or more shared interfaces must:

- install the required traffic control devices at each level crossing in accordance with AS1742.7 (or higher, or as otherwise approved by the road manager or the rail infrastructure manager depending on state's legislative requirements.), the responsibility for which being agreed and set out in the interface agreement
- establish agreed standards for the condition to which the traffic control devices must be maintained and operated, as appropriate
- establish agreed responsibilities, processes, triggers and frequency for inspecting the condition, presence and operation of traffic control devices in both daylight and nighttime conditions
- establish a program of work for the replacement of obsolete or superseded traffic control devices
- document the above agreements and processes within the interface agreement between the parties that is anticipated under section 107 or 108 of the RSNL
- include in the interface agreement a trigger to jointly review the agreements and processes following any amendment to AS1742.7
- implement the agreed processes and procedures
- maintain documented records of inspections, corrective actions, decisions or other matters relating to the installation, monitoring and management of traffic control devices.

9. VISIBILITY REQUIREMENTS – LINES OF SIGHT

Providing a road user with the ability to effectively sight a traffic control device or a train, making them aware of the need to respond, is key to ensuring the effectiveness of level crossing control treatments. In the case of drivers, the need to sight the traffic control device or train often arises while the driver is still driving at signed road speeds, with all the information and distractions that continually present to a driver.

To comply with the code, hazards impacting the visibility along sight lines on the road and rail corridor that must be considered by the rail infrastructure manager and road manager when assessing the risk of a road user not being able to see a train or traffic control devices and safely decide when to cross the level crossing include:

- obstructions introduced into the sight line due to the curvature of the road and/or rail track
- poor road condition impacting the ride and ability to focus attention along the sight lines
- road traffic types and volume that may impact the ability to view sight lines across traffic lanes
- encroaching vegetation, including seasons growth
- obstructions in the sight lines from structures or other things under the control of the rail infrastructure manager or road manager
- obstructions in the sight lines from structures or other things on private property (not under the control of the rail infrastructure manager or road manager)
- time of day impacts on the visibility of traffic control devices, e.g., during sunrise or sunset (including sun glare)
- sighting to the departure side of the crossing being obscured or cluttered, leading to uncertainty that a driver can safely clear the crossing once it has been entered
- visibility cues obscured on approach due to curves or crests
- road approach angles not at 90° to the railway, reducing the opportunity to pick up reflective markers with headlights
- short stacking distance before or after the crossing
- crests across the crossing.

When assessing the hazards and risks, rail infrastructure managers and road managers should consider sight line requirements from the perspective of all road users. For example, heavy vehicle drivers are often seated higher than light vehicle drivers, a heavy vehicle driver may be able to see over an obstruction that a light vehicle driver may not.

9.1. APPLICABLE STANDARDS

AS1742.7 establishes technical standards for required lines of sight and sight distances for the available level crossing protection treatment options.

AS7658 provides rail transport operator focused operational and engineering requirements for the management of level crossing risks, including general maintenance requirements.

9.2. REQUIRED RISK CONTROLS

To comply with the code, rail infrastructure managers and road managers that manage one or more shared interfaces must:

- take actions, as far as reasonably practicable, to establish the required sight lines and distances at each level crossing in accordance with AS1742.7, the responsibility for which being agreed and set out in the interface agreement
- establish agreed standards for the condition in which the sight lines must be maintained
- manage the speed environment of both the approaching road and railway

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- establish agreed responsibilities, processes, triggers and frequency for inspecting the condition, of the required sight lines – including establishing clear direction for the responsibility and approval for the management and, if necessary, clearance of vegetation within the sight lines
- document the above agreed standards and processes within the interface agreement between the parties that is anticipated under section 107 or 108 of the RSNL
- include in the interface agreement a trigger to jointly review the agreements and processes following any amendment to AS1742.7
- implement the agreed processes and procedures
- maintain documented records of inspections, corrective actions, decisions or other matters relating to the monitoring and management of the sight lines along the road and rail corridor.

9.3. COMPROMISED SIGHT LINES

In situations where unobstructed sight lines across the required sighting distance cannot be established, to comply with the code, the rail infrastructure manager and road manager must further assess the specific risks to visibility at the crossing with a view to determining whether a road user will still be provided with appropriate opportunity to make a safe decision and take appropriate action when relying on the ability to see a train or traffic control device.

In the case that the available sighting opportunity along the sight lines is not considered sufficient, alternative level crossing treatments or road traffic management options must be considered to comply with the code.

To comply with the code, where locations exist on a railway where effective sight lines cannot be provided, road managers and/or rail infrastructure managers must have a program of work to establish the sight lines and/or amend the level crossing or road management treatment. This program of work must be coordinated with the interfacing manager.

10. VISIBILITY REQUIREMENTS – TRAIN CONSPICUITY

Notwithstanding the provision of adequate sight distance and clear sight lines, where the level crossing relies on a train being seen, a train itself must be conspicuous. That is, it must be noticeable and clear against its surroundings so that it can be effectively seen by a road user on the approach to and at level crossings.

The ability of road users to see a train that:

- is approaching and assess a safe gap in which to cross, or
- is on a level crossing and come to a stop

is a primary control for the effectiveness of passively controlled level crossings.

To comply with the code, hazards impacting the conspicuity of a train that must be considered by the rolling stock operator and rail infrastructure manager when assessing the risk of a road user not seeing a train that is approaching a level crossing include:

- insufficient illumination or lighting of the train (including the locomotive or train consist)
- poor contrast between the approaching train, typically the head of the train, and the landscape
- poor or indistinguishable train lighting during nighttime operations
- loss of contrast for the train due to livery or poor cleanliness of the train
- time of day impacts on the visibility and contrast of a train, e.g. during sunrise or sunset (including sun glare)
- the angle and position of the road and rail infrastructure relative to each other (particularly at night time which can affect whether a road user's light illuminates the train or not)
- sight line background environment masking the lead locomotive, e.g., due to landscape hues or agricultural crops
- likely climatic or atmospheric conditions, e.g. seasonal impacts, dust, fog, high rainfall, overcast skies.

10.1. APPLICABLE STANDARD

AS7531 establishes technical standards for locomotive lighting and rolling stock livery and reflectivity that provide good practice for enhancing and maintaining train visibility.

However, as it is a minimum standard, it may not be sufficient to ensure that a road user at specific level crossing locations will be made aware of or able to see an approaching train in all operating circumstances.

To comply with the code, rolling stock operators must therefore assess and document whether additional lighting, beyond what is recommended in the standard, on their lead locomotives (lead vehicle of EMU and DMU), or along the train consist is required to ensure, so far as is reasonably practicable, that road users will be made aware of and/or are able to see approaching trains at the level crossings which form part of their rail operations.

To comply with the code, reasons for deviating from the standard or, for or against additional lighting must be documented as part of the risk assessment process along with the supporting evidence to justify the decision.

An important consideration for all operators is that they risk assess their level crossing environments to identify the most appropriate controls for their particular operations. While the code sets out a range of risk controls the option is always there for an operator to implement alternative lighting and visibility controls than those in AS7531 to eliminate or reduce the risk, so far as is reasonably practicable, provided the controls achieve equal to or better than what AS7531 provides.

10.2. REQUIRED RISK CONTROLS

To comply with the code, interfacing rolling stock operators and rail infrastructure managers must:

- identify the high-risk level crossing interfaces and consider the use of additional lighting or other relevant rolling-stock based risk control measures to minimise the risks of collision at those locations
- establish lighting, livery, reflectivity or other necessary requirements for the safe use of crossings on the railway
- establish the quality and condition to which the visibility elements of the established requirements of the level crossing and its surrounding environment must be maintained
- establish the responsibilities, processes, triggers, and frequency for inspecting compliance with and effectiveness of the established level crossing requirements
- document the above requirements, agreements, and processes within the interface agreement between the parties that is anticipated under section 106 of the RSNL

An important consideration for all operators is that they risk assess their level crossing environments to identify the most appropriate controls for their particular operations.

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- include in respective interface agreements a trigger to jointly review the established requirements, agreements and processes following any amendment to AS7531
- implement the agreed requirements and procedures
- maintain documented records of inspections, corrective actions, decisions, or other matters relating to the implementation, monitoring and management of train visibility related controls at level crossings.

To comply with the code rolling stock operators must:

- establish lighting, livery, reflectivity, cleanliness or other necessary requirements in accordance with AS7531 for the safe use of crossings on the railway
- maintain documented records of inspection, corrective actions, decisions, or other matters relating to the implementation, monitoring and management of train visibility controls at level crossings
- consider the use of beacon and side marker lights as a means to improve luminance contrast due to the increased efficacy additional lighting has on lead locomotive (lead vehicle of EMU and DMU) conspicuity at night, at wide view angles, and in misty weather conditions
- consider the use of beacon lights to improve luminance contrast levels of locomotives in situations where procedures restrict the use of high beam for operational reasons (such as avoiding potential dazzling effect on oncoming road or rail traffic)
- consider the use of front beacon lights during the night to improve locomotive conspicuity when locomotive headlights may be on low beam
- Identify the high-risk level crossing interfaces their trains will operate through and consider the use of additional lighting or other relevant rolling-stock based risk control measures to minimise the risks of collision at those locations
- establish and implement as part of the operator's safety management system, inspection and maintenance processes and procedures to monitor and maintain the visibility elements of the established requirements
- if required, establish, and implement a program of work to modify rolling stock to achieve the established requirements.

It is understood that some rolling stock operators cross networks of multiple rail infrastructure managers who may each have different train conspicuity requirements for accessing their network. Any requirements from rail infrastructure managers relating to the lighting, livery and reflectivity of the trains accessing their networks should be evidence based.

Where approaches to managing risks for one railway network have potential impacts on other railway networks the best practicable safety outcome should be sought.

10.3. MODIFICATION OF EXISTING ROLLING STOCK

To comply with the code, rolling stock operators (including Tourist and Heritage operators) must assess the risk implications of operating rolling stock with the relevant rail infrastructure manager, with the aim of establishing a program of work to modify the rolling stock to the expected requirements. The timeframe for delivering the program of work may be agreed between a rolling stock operator and rail infrastructure manager but must not exceed 5 years for non-compliant rolling stock.

ONRSR understands the scope of AS7531 is for new and modified rolling stock however the intention of this code is for this standard to also be applied to existing rolling stock. This includes Tourist and Heritage rolling stock operating through level crossings.

11. DEFINITIONS AND ABBREVIATIONS

Definition or explanations of abbreviations and industry terminology.

Driver – as defined by Rule 16 of the model Australian Road Rules is the driver of a road vehicle.

In the code a reference to **driver** includes **rider** and each reference to driving includes a reference to **riding**.

Level crossing – includes each of the following areas:

(a) an area where a road and a railway (other than a tramway) meet at substantially the same level, whether or not there is a level crossing sign on the road at all or any of the entrances to the area

(b) a pedestrian crossing –

being an area where a footpath or shared path crosses a railway (other than a tramway) at substantially the same level, whether or not there is a level crossing sign on the path at all or any of the entrances to the area

*for the purpose of this code a level crossing does not include where a road and tramway meet

Officer – (a) in relation to a body corporate, has the same meaning as officer in relation to a corporation under section 9 of the *Corporations Act 2001* of the Commonwealth;

(b) in relation to any other person, means an individual who makes, or participates in making, decisions that affect the whole, or a substantial part, of the business or undertaking of the person.

Pedestrian – as defined by Rule 18 of the model Australian Road Rules.

Rail infrastructure manager – in relation to rail infrastructure of a railway, means the person who has effective control and management of the rail infrastructure, whether or not the person -

(a) owns the rail infrastructure; or

(b) has a statutory or contractual right to use the rail infrastructure or to control, or provide, access to it.

Rail safety worker – means an individual who has carried out, is carrying out or is about to carry out, rail safety work.

Rail transport operator – (a) a rail infrastructure manager; or

(b) a rolling stock operator; or

(c) a person who is both a rail infrastructure manager and a rolling stock operator.

Regulator – means the National Rail Safety Regulator or an Acting National Rail Safety Regulator appointed under Part 2 Division 2 of the RSNL.

Rider – as defined by Rule 17 of the model Australian Road Rules.

Road manager – (a) in relation to a private road – means the owner, or other person responsible for the care, control and management of the road; or

(b) in relation to a public road – means an authority, person or body responsible for the care, control or management of the road.

Road user – as defined by Rule 14 of the model Australia Road Rules is a driver, rider, passenger, or pedestrian.

Rolling stock operator – a person who has effective control and management of the operation or movement of rolling stock on rail infrastructure for a railway but does not include a person by reason only that the person drives the rolling stock or controls the network.

Rolling stock – for the purposes of the code means a vehicle that operates on or uses a railway and includes a locomotive, carriage, rail car, rail motor, train, wagon but **does not include** light rail vehicle, tram, light inspection vehicle, self-propelled infrastructure maintenance vehicle, trolley, monorail vehicle or a vehicle designed to operate both on and off a railway.

RSNL – Means the Rail Safety National Law which has been enacted as a Schedule to the *Rail Safety National Law (South Australia) Act 2012 (SA)* as it applies in each state and territory.

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Train – for the purpose of the code, reference to a train means:

(a) 2 or more units of rolling stock coupled together, at least 1 of which is a locomotive, diesel multiple unit (DMU) or electric multiple unit (EMU) ; or

(b) a unit of rolling stock that is a locomotive, DMU or EMU

*reference to train does not include trams in the code.

Train conspicuity – measures to make a train visible in contrast to the natural environment or its presence known to road users.

12. KEY CONTACTS

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13. REFERENCES

Appendix A – Overview of risk management framework at level crossings

Model Australian Road Rules

ONRSR Publications (available at onrsr.com.au)

Meaning of duty to ensure safety SFAIRP Guideline

Interface agreements Fact Sheet

Interface Agreements - Information for Road Managers Fact Sheet

Template interface agreement for road or rail crossings

Using the template interface agreement for rail or road crossings Guideline

General Safety Duties under the RSNL – 'Upstream' Duty Holders Fact Sheet

Safety Management System Guideline

ONRSR Level Crossings Policy

Relevant Standards

AS 7531 Rolling stock lighting and visibility

AS 7658 Level crossings – rail industry requirements

AS 1742.7 Manual of Uniform Traffic Control Devices – Railway Crossings

AS 1742.3 Manual of Uniform Traffic Control Devices – Traffic control for works on roads

Rail Industry Safety and Standards Board

Safe operation of restricted access vehicles across level crossings Guideline

Consolidation of public level crossings Guideline

Australian Level Crossing Assessment Model (ALCAM)

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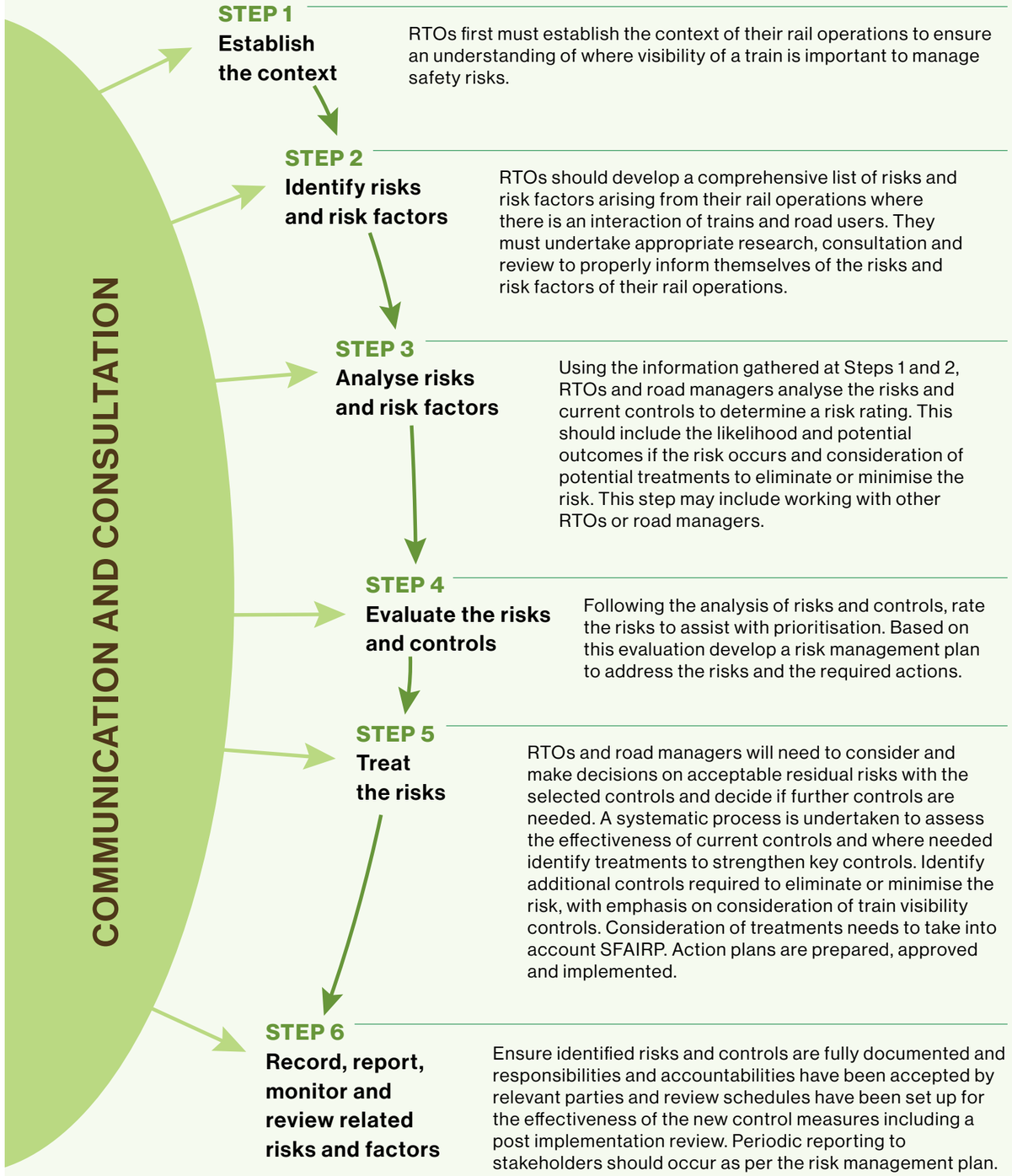
14. APPENDIX A – OVERVIEW OF RISK MANAGEMENT FRAMEWORK AT LEVEL CROSSINGS



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