Rail Safety

Code of Practice – Level Crossings and Train Visibility

Contents

Foreword

This Rail Safety Code of Practice – Level Crossings and Train Visibility (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, so far as is reasonably practicable, compliance with the law.

There are more than 20,000 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 and visibility of trains approaching level crossings.

A Code of Practice was seen as the best mechanism to ensure a structured approach for road and rail entities to apply to achieve improved awareness and visibility (incl illumination) of trains approaching level crossings by drivers and pedestrians.

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.

The code draws on a systems risk management approach to the identification, assessment, and selection of controls to manage risks arising from interactions between trains, people, and vehicles at level crossings with an emphasis on improving train illumination within the broader objective of improving awareness and visibility of trains approaching level crossings.

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

A systems risk management approach 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.

1. Purpose

The purpose of the *Code of Practice – Level Crossings and Train Visibility* (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 interfaces where interactions occur between trains, people, and vehicles. It is intended to provide a nationally consistent way forward for improved awareness and visibility of trains.

In outlining a risk management approach, the code

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

ii. provides an understanding of the suite of safety control measures available to manage the risk arising from the interaction between trains, people, and road vehicles at level crossings, and

iii. promotes a systems approach for the prevention of fatal and serious injuries and collisions at level crossings for road and rail users.

The code focuses on improving train (locomotive) visibility specifically the conspicuity of the lead locomotive (or road-rail vehicle where applicable) on approach to a level crossing.

Definitions of terms and abbreviations used in this code are provided in section 10.

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 road/rail interface 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 road/rail interfaces.

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

An understanding of human factors and human behaviour should be considered by the rail infrastructure or road manager so associated risks may be addressed in the design of the level crossing where possible.

2.1. Out of scope

Out of scope of this code is the enforcement of road user behaviour which is not within the authority of the ONRSR.

3. The hazard/risk

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 road and rail interfaces is not achievable and interfaces remain at grade, safety at level crossings is principally governed by the established principle, 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 entrenched through the *Australian Road Rules*.

However, in hand with the need to give way, is the need to ensure road users are provided with sufficient awareness (and visibility) of approaching trains such as clear warning of and/or the ability to observe the approach or presence of a train they need to yield to when crossing railway tracks.

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

Considerations include:

- Road user not recognising the level crossing
- Road user not looking for a train
- Road user speeding
- Road user fatigued
- Road user not seeing what they are not expecting
- Train driver not sounding the horn and/or activating ditch lights
- Level crossing lights not activating properly
- Level crossing not meeting standards
- Level crossing has not been risk assessed or treated properly.

Instruction to road users on how to safely use level crossings is provided through jurisdictional driver licensing regimes, the *Australian Road Rules* and through the application of consistent and standard level crossing interface controls set out in *Australian Standard AS1742.7 – Manual of Uniform Traffic Control Devices – Railway Crossings.*

These standards provide a minimum treatment level based on characteristics of a typical level crossing. 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 road/rail 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.

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 railway tracks.

The RSNL principle of shared responsibility for rail safety (s.50) means that rail transport operators and road managers must continue to apply a risk assessment process and monitor and manage the risk of

controls at level crossings (or similar interfaces) being made ineffective due to:

- deterioration of the traffic control devices used to warn and control road users;
- the traffic control devices and/or trains using the interface 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.

It is these areas of risks to safety 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 6, 7 and 8 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.

4. Application

The code provides commentary on the common risks that should be known and considered in the management of safety at level crossings. These are presented from the perspective of improving a road user's ability to safely cross railway tracks at typical level crossing configurations. The code provides guidance on how to manage such risks to safety, so far as is reasonably practicable.

Users of the code may need to 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 illumination 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.

Rolling stock operators must assess and document whether additional lighting on their locomotives or along the train consist is required to ensure, so far as is reasonably practicable, that vehicle drivers and pedestrians 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 or against additional lighting require documentation as part of the risk assessment process along with the supporting evidence to justify the decision.

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

4.1. 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 through the establishment of safety interface agreements between rolling stock operators, rail infrastructure managers and road managers to manage risks to safety at road and rail interfaces. While the *Australian Road Rules* establish the requirements or rules for road users to follow to safely cross railway tracks.

Under s106 and 107 of the RSNL Rolling stock operators, 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.

Controls that enable train visibility for the road user through better sighting along the rail and road corridor are agreed between road managers and rail infrastructure managers to allow for a safe crossing of a railway whereas risk controls that enable visibility of an approaching train for road users through illumination and conspicuity are agreed between the rollingstock operator and rail infrastructure manager. Further information on interface agreements is available on the ONRSR website.

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 passive control equipment at the crossing and maintaining the line of sight along the rail corridor.
- road managers are responsible for the provision of advance warning and pavement markings along with other devices 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.
- 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 ditch lights in place to improve awareness and visibility of approaching trains.

Road managers of private level crossings are only required to enter into an interface agreement under s108 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 but does not preclude the relevant parties from adopting additional arrangements through interface agreements to manage safety so far as is reasonably practicable.

4.2. Road user behaviour

Road user behaviour, by both drivers and pedestrians, is a critical control for managing safety at level crossings.

The *Australian Road Rules* establish the behaviour expected of road users to safely cross railway tracks. 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 *Rules*.

In response, road users expect to be presented with common and consistent warning, control and sighting treatments at level crossings aligned with the training and instruction they have received through the driver licensing process.

However, given the limits of human performance, 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 *Rules*.

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

For example, drivers and pedestrians crossing railway tracks in an unsafe manner may be the result of human factors including for:

- road users –
    - misjudging the speed and distance of the train
    - expecting (or not) to see a train because of past experience
    - not expecting to see a train so looked but didn't see it
    - expecting there to be built-in tolerance for error

Consequently, understanding human factors and their impact on human behaviour especially at level crossings may assist in better design of level crossing and in the selection of treatments used to control risks to safety at level crossings.

5. Visibility requirements – level crossing protection controls

The selection process for the combination of traffic controls 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.

Table 1 outlines the expectations of road user in response to common types of level crossing traffic controls as set out in the *Australian Road Rules*.

Rail transport operators and road managers should use this table along with human factors considerations as outlined above to inform their risk assessments when considering road user 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 controls necessary to manage the risk to safety at the level crossing, their effectiveness will depend on the vehicle driver or pedestrian being aware of or able to see them and responding to them as expected.

Table 2 sets out the additional controls such as line of sight and train conspicuity (make the train more visible or aware to the vehicle driver or pedestrian) that must be in place at typical level crossing across Australia to ensure trains or installed traffic control devices at level crossings are seen or apparent to road users.

Table 1 – Common Traffic Controls at Level Crossings

Common Traffic Controls (Protection Type)	Driver/User expectations for common traffic controls at level crossings
Give Way Sign (Passive Control) *Australian Road Rules 122 and 123*	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. 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 railway 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. Drivers do not always slow down as they should especially if they do not perceive a train is approaching.
Stop Sign (Passive Control) *Australian Road Rules 121 and 123.*	Signals to road users the need to stop at the Stop Sign (or Stop line). 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. 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. Human beings are unreliable in their judgements of these factors.
Flashing lights with or without boom gates (Active Control)	Signals to drivers that a train is approaching the level crossing. When lights are flashing drivers are expected to stop at the flashing light assembly or Stop line until the flashing lights have extinguished. 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. Observed driver behaviour suggests they may even speed up to reduce any error margin. Drivers do not expect to have to look for trains. Drivers expect they can rely on the active crossing control for direction on the need to stop or continue safely. 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. Alternative engineering controls such as commencing flashing lights earlier to improve certainty of sufficient time to safely cross may need to be considered.

Common Traffic Controls (Protection Type)	Driver/User expectations for common traffic controls at level crossings
Level crossing gates - automated or manual (Active Control)	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. Where the gates are closed, or closing, drivers are expected to stop at the gate until they re-open. 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.
Road traffic controller (Manual Control)	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. 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.* Road traffic controllers expect drivers having been warned, will slow and prepare to stop on the road traffic controller's direction. Drivers then expect their movement will be directed by the traffic controller, typically a Stop or Slow (proceed) instruction. 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 – 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 - present and maintained.	Required.	Required.	Required.	Required.	Required.	
Crossing protection traffic control devices - present and maintained.	Required.	Required.	Required.	Required.	Required for permanent installations	
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.				Required.
Trains - visible and conspicuous, sufficient for the perceptual needs of road users.	Required.	Required.	Desirable.		Required	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 a publicly accessible track 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.

The controls and requirements in Table 2 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, train conspicuity controls and requirements in Table 2 (to make the train more visible or aware to the vehicle driver or pedestrian) 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 visibility required to ensure road users are made aware of and can see a train approaching a level crossing.

For example, even for a railway with most level crossings under active protection controls, where train visibility may be less critical, the presence of one or more passive road or pedestrian 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 or pedestrian level crossings.

Passenger or freight trains that are used frequently, at high speed and in poor light may be recognised of the need for greater risk controls. However, assessment to the appropriate risk controls for low frequency crossings requires particular consideration given their over representation in level-crossings incidents (refer Section 4.2 Road user behaviour).

6. 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 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 and 2).

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, that they are approaching and will know what to do at a level crossing. Such hazards include:

- 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 on the visibility of traffic control devices, e.g., during sunrise or sunset (including sun glare),
- background environment clutter diminishing the prominence of the traffic control devices, and
- 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 driver expectations.

6.1. Applicable standards

Australian standard *AS1742.7 – Manual of Uniform Traffic Control Devices – Railway Crossings* establishes technical standards for the selection and installation of traffic control devices at and on approach to level crossings. The standard sets a uniform application of traffic control devices for public roads against which driver training and licensing requirements are set.

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* 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.

6.2. Required risk controls

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 as otherwise approved by the road manager), 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,
- document the above agreements and processes within the interface agreement between the parties that is anticipated under s.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, and
- maintain documented records of inspections, corrective actions, decisions or other matters relating to the installation, monitoring and management of traffic control devices.

6.3. Replacing obsolete or superseded traffic control devices

The purpose of traffic control devices is to provide information to road users. It is important therefore that the knowledge of and interpretation of the device is established and common to road users. Obsolete or superseded traffic control devices that no longer form part of or are not consistent with those promoted in driver licensing training or instruction, or general road user education and safety promotion, must be replaced with the appropriate and current traffic control devices (as per AS1742.7).

Road managers and/or rail infrastructure managers must have a program of work for the replacement of such devices as soon as is reasonably practicable. This program of work must be coordinated with the interfacing manager to provide consistent and expected information to road users.

7. 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 behaviour controlling traffic control device or train often arises while the driver is still driving at safe road speeds, with all the information and distractions that continually present to a driver.

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 driver (or pedestrian) not being able to see a train and safely decide when to cross the tracks 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,
- angles of approach not 90° reducing the opportunity to pick up reflective markers with headlights,
- short stacking distance before or after the crossing, and
- crests across the crossing.

7.1. Applicable standards

Australian standard *AS1742.7 – Manual of Uniform Traffic Control Devices – Railway Crossings* establishes technical standards for required lines of sight and sight distances for the available level crossing protection treatment options.

Australian standard *AS7658 Level crossings – rail industry requirements* provides rail transport operator focused operational and engineering requirements for the management of level crossing risks, including general maintenance requirements.

7.2. Required risk controls

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,
- 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 s.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, and
- maintained 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.

7.3. Compromised sight lines

In situations where unobstructed sight lines across the required sighting distance cannot be established, the rail infrastructure 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.

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 or amend the level crossing or road management treatment. This program of work must be coordinated with the interfacing manager.

8. Visibility requirements – train conspicuity

The ability of road users to see a train that is approaching or is on a level crossing and to assess a safe gap in which to cross is a primary control for the effectiveness of passively controlled level crossings. Notwithstanding the provision of adequate sight distance and clear sight lines, if a train cannot be effectively seen by a road user the passive control becomes compromised.

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),

- sight line background environment masking the lead locomotive, e.g., due to landscape hues or agricultural crops,

- Likely climatic or atmospheric conditions, e.g., dust, fog, high rainfall, overcast skies.

8.1. Applicable standard

Australian standard *AS7531 – Rolling stock lighting and visibility* 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, which outlines common risk controls for typical level crossings, 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.

Rolling stock operators must therefore assess and document whether lighting on their locomotives or along the train consist is sufficient 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. Reasons for or against additional lighting should be documented as part of the risk assessment process along with the supporting evidence to justify the decision.

8.2. Required risk controls

Interfacing rolling stock operators and rail infrastructure managers must:

- 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 s.106 of the RSNL,

- 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 for a rail infrastructure manager, and

- 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.

Rolling stock operators must:

- establish lighting, livery, reflectivity 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 locomotive 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; and
- if required, establish, and implement a program of work to modify rolling stock to achieve the established requirements.

8.3. Modification of existing rolling stock

It is acknowledged that there are financial and engineering implications to modifying existing operational non-complying rolling stock to comply with the requirements of AS7531, particularly regarding lighting arrangement on locomotives or in assessing the need for additional lighting beyond what the standard recommends.

Rolling stock operators should assess the risk implications of operating such rolling stock with the relevant rail infrastructure manager, with the aim of establishing an agreed program of work to modify the rolling stock to the expected requirements. The timeframe for 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.

9. 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 typical level crossings. Depending on the risk assessment and the management of risk so far as is reasonably practicable may require a higher control or level of mitigation than applies in the standard.

Application of a code of practice is not mandatory. However, 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.

10. Definitions and abbreviations

Definition or explanations of abbreviations and industry terminology

Train conspicuity – measures to make a train visible in contrast to the natural environment or its presence known to drivers or pedestrians

LX – **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 –

(i) 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.

RIM – 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.

RM – 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.

RSO – 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

RTO – 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

RSNL – Rail Safety National Law

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

Train – (a) 2 or more units of rolling stock coupled together, at least 1 of which is a locomotive or other self-propelled unit; or

(b) a unit of rolling stock that is a locomotive or other self-propelled unit

*for the purpose of this code reference to train does not include trams.

11. Key Contacts

Visit: www.onrsr.com.au
Email: contact@onrsr.com.au
Phone: (08) 8406 1500

12. References

Appendix A – Overview of train visibility risk management process

ONRSR Publications

Meaning of Duty to ensure Safety SFAIRP Guideline

Interface agreements Fact Sheet

Interface Agreements for Road Managers Fact Sheet

Template interface agreement for road or rail crossings

Guideline for using the template interface agreement for rail or road crossings

Control Assurance Fact Sheet

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

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)

Australasian Centre for Rail Innovation

Freight Train Visibility Review – Final Report 31 January 2022

Monash Institute of Railway Technology

Assessment of Trials to Improve Train Conspicuousness Approaching Passive Level Crossings March 2023

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Appendix A – Overview of train visibility risk management framework

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