



AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline: Engineering (Track & Civil)

Category: Specification – ARTC CoP

# Supplementary Appendix to ARTC Track & Civil Code of Practice

## Design Criteria for Pedestrian Crossings ETD-16-01

### Applicability

ARTC Network Wide		Western Jurisdiction	
New South Wales		Victoria	✓

### Primary Source

VRIOGS 003.2-2006 Appendix B Criteria for Infrastructure at Railway Level Crossings – Pedestrian Crossings

### Document Status

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# 1 Introduction

## 1.1 Purpose

The Standard has been created through the collaboration of members of the Victorian Rail Industry Operators' Group (VRIOG) for the purpose of establishing standards which, if implemented throughout the Victorian Rail Network, will facilitate the interoperability of infrastructure.

The use of the Standard is not prescribed by law but, if adopted, conformity with the provisions of the Standard is mandatory in order that the purpose of the Standard be achieved.

The Department of Infrastructure proposes to issue standards for the *maintenance* of the rail network in the future. That standard will touch on some of the issues covered in this standard such as flangeway gap tolerances and surface irregularities. This standard is primarily concerned with the *design* of new facilities.

## 1.2 Scope

This document mandates the accepted criteria that shall be employed when designing new, or executing substantial alterations to, all pedestrian level crossings on the Victorian Rail Network. The purpose of this Pedestrian Level Crossing Standard is to ensure that the design of all future pedestrian level crossings are designed to be as safe as practicable.

This standard does not provide guidance on the level of protection that should be provided but does give design guidance once the decision is made as to whether the crossing should be controlled Actively or Passively.

## 1.3 Application

This standard is to be applied in any circumstance of Substantial Alteration to, or new construction of at-grade pedestrian crossings of rail lines where separate provision is made for pedestrians.

This standard is to be used in conjunction with Australian Standards. This Standard contains more onerous requirements than that of the equivalent Australian Standard which remains in a draft format. Therefore this Standard is the overriding authority where differences are encountered.

## 1.4 Disability Discrimination

There is a legal requirement that new public transport facilities conform to the Disability Standards for Accessible Public Transport. The standard described in this document complies with the requirements of the Disability Discrimination Act 1992 Disability Standards for Accessible Public Transport 2002 and any referenced versions and clauses of Australian Standards. Where there is any inconsistency they override this document.

Any other Australian Standards are secondary to the above.

Compliance with the DDA Transport Standards may be met by:

- applying the relevant specifications before the target dates; or
- using methods, equipment and facilities that provide alternative means of access to the public transport service concerned (but not using separate or parallel services) with equivalence of amenity, availability, comfort, convenience, dignity, price and safety. This may include direct assistance over and above that required simply to overcome discrimination.

The operator or provider of a public transport service must consult with passengers with disabilities who use the service or with organisations representing people with disabilities, about any proposal for equivalent access. One such organisation is the Victorian Public Transport Access Committee.

An access path that departs in minor ways from the Transport Standards may be regarded as deemed to comply if it meets the performance requirements of AS1428.2 Clause 7 with equivalent effectiveness, amenity, availability, convenience, dignity, and safety. However, direct assistance may be required to ensure that a non-conforming access path of this kind is available to all passengers. This may translate to assistance being provided by station staff in some situations.

## 1.5 Background

The previous standards for at-grade pedestrian crossings of rail lines predated the introduction of the Disability Standards for Accessible Public Transport 2002. This standard updates the existing standards to take account of the needs of pedestrians with disabilities when negotiating at-grade crossings.

## 1.6 Reference Documents

The following documents have been used as references in preparation and usage of this Standard:

- Disability Standards for Accessible Public Transport 2002 (revised 2004)
- Australian Standard AS1428 Design for Access and Mobility
- Part 1 (2001): General requirements for access – new building work
- Part 2 (1992): Enhanced and additional requirements – buildings and facilities
- Part 4 (1992): Tactile ground surface indicators for the orientation of people with vision impairment
- Part 4 (2002): Tactile indicators
- Australian/New Zealand Standard AS/NZS1158 Road Lighting
- Part.3.1 (1999): Pedestrian area (Category P) lighting – performance and installation design requirements
- Australian Standard AS1742 Manual of Uniform Traffic Control Devices
- Part 1 (2003): General introduction and index of signs
- Part 7 (1993): Railway crossings
- Australian Standard AS/NZS 2144:2002 Traffic signal lanterns

## 1.7 Definitions

The following terms and acronyms are used within this document:

Term or acronym	Description
Active Crossing	Pedestrian crossings where approaching trains instigate warnings to pedestrians intending to cross.
Approach Path	The path from the Municipal Footpath Network to the Enclosure beside the rail tracks.
Disability Discrimination Act (DDA)	The Australian Federal Disability Discrimination Act 1992.
Enclosure	A layout of fences at the approach to rail crossings to improve safety for pedestrians at both passive and active crossings. Enclosures are also known as corrals and the passive version is also known as a maze.
Luminance Contrast	The amount of light reflected from one surface or component, compared to the amount of light reflected from the background or surrounding surfaces. For further information, see Australian Standard AS/NZ1428.4 (2002).

Term or acronym	Description
Municipal Footpath Network	The footpath network in the vicinity of the pedestrian rail crossing administered by the local municipal authority. May include paths, car parks and other open areas which pedestrians traverse in order to reach the approach path to the rail crossing.
Passive Crossing	Pedestrian crossings where approaching trains do not instigate warnings to pedestrians intending to cross.
Public Transport Access Committee	This committee was created by the Minister of Transport and provides advice on issues relating to public transport access. It can be reached through the Victorian Department of Infrastructure.
Scooter	A motorised chair commonly used by frail elderly pedestrians. Unlike a motorised wheelchair, scooters are usually steered by a tiller which functions like a handlebar on a bicycle. Scooters are usually less manoeuvrable than motorised wheelchairs, typically having a longer wheelbase. Scooters are also referred to as 'gophers' or 'buggies'.
Step Ramp	An inclined access way with a length not greater than 1540mm and a gradient not steeper than 1 in 8, located in, or instead of, a step other than a kerb. Also known as a 'pram crossing' or 'kerb cut'.
Substantial Alteration	All crossings upgraded from Passive to Active Protection or to achieve DDA compliance will be done so in accordance with this Standard. Other activities that result in a physical change to the design of a Pedestrian Crossing shall also be in accordance with this Standard. For the avoidance of doubt this might include the relocation of a crossing or a modification of an associated feature ie a station upgrade. Maintenance or repair of any or all components of a Pedestrian Crossing are not deemed to constitute a Substantial Alteration.
Tactile Surface Ground Indicator	Areas of raised ground surface texture treatment, designed to provide blind or vision-impaired pedestrians with warning and/or directional orientation information. For further information, see Australian Standard AS/NZ1428.4 (2002).
VRIOG	<p>The Victorian Rail Industry Operators' Group comprising the following members:</p> <ul style="list-style-type: none"> <li>• Pacific National</li> <li>• Vic Track</li> <li>• V/Line Passenger</li> <li>• Connex Melbourne</li> <li>• Yarra Trams</li> <li>• Freight Australia</li> <li>• Australian Rail Track Corporation</li> <li>• Public Transport Division of the Department of Infrastructure</li> </ul>

## 2 Siting of Pedestrian Crossings

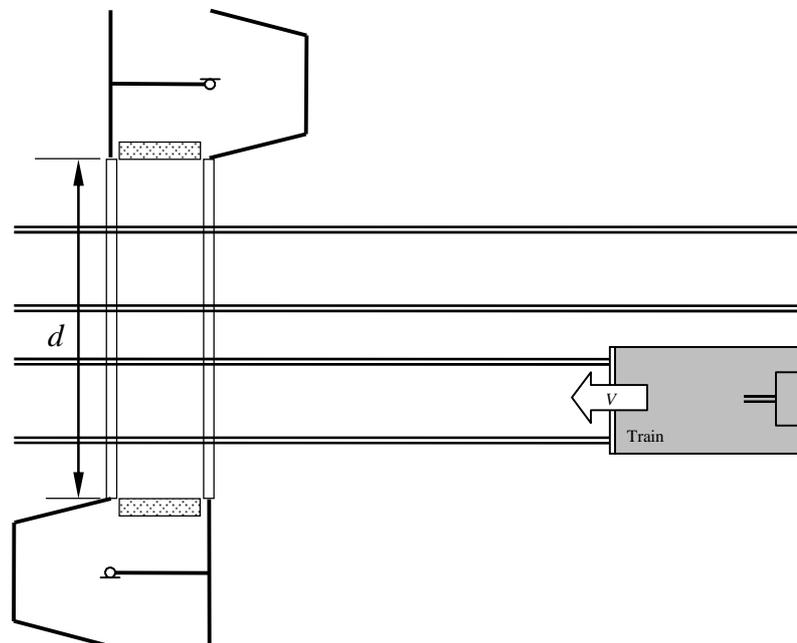
### 2.1 General

There are a range of legal pedestrian crossings ranging from a widening of the adjacent road, a separate path, a path with signs, a crib enclosure, pedestrian booms and gates with visual and audible warnings.

### 2.2 Sight Distance at Passive Crossings

At a railway crossing at which there is no active control for pedestrian traffic the minimum sight distance ( $SD$ ) in metres to be available for pedestrians to oncoming trains shall be as shown in Figure 1.

Figure 1: Sight Distance Definitions



$$SD = \frac{V}{3.6} \left( \frac{d}{1.0} + 2 \right)$$

where

$V$  = track speed of trains in km/h

$d$  = pedestrian crossing distance in metres, measured as follows;

- i. Where pedestrian mazes are provided- from one trackside maze opening to the other.
- ii. Where there are no pedestrian mazes but there are Tactile Ground Surface Indicators at holding positions- from one trackside edge of the Tactile Ground Surface Indicator to the other.
- iii. Where there are no pedestrian mazes or Tactile Ground Surface Indicators- outer rail to outer rail plus 3m.

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*Note A: The above formula is based on a walking speed of 1.0 m/s and provides a safety margin of 2 s. It is recommended that at crossings where there is likely to be significant use by people with ambulant disabilities, the walking speed be reduced to 0.8 m/s.*

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*Note B: The sight distance should be greater than the distance equivalent to a crossing time of 10 seconds. This applies even for crossings where only one track is crossed.*

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If this sight distance is not available one or other of the following will be required:

- Removal of obstructions to achieve the required sight distance.
- Provision of active control.
- Closure or relocation of the crossing.
- Reduction of train speed.
- Grade separation.

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*Note: Removal of obstructions includes any removal of material from a cutting face which will restore the required sight distance. Maintenance of plant growth will be needed to ensure retention of sight distance.*

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## 2.3 Angle of Crossing

### 2.3.1 Angle of Crossing

To assist pedestrians with vision impairment or other disabilities the pedestrian path shall cross the rail tracks at right angles ( $90^{\circ}\pm 20^{\circ}$ ) even if the adjacent road is **skewed**. However every effort should be made to achieve a right-angled crossing. Under the following circumstance a right-angled crossing may not be practicable.

- the topography of the site is inhibitive
- the crossing angle is restricted by the proximity of assets that cannot reasonably be relocated.
- the possibility that pedestrians would ignore a formal right-angled crossing and skirt around the crossing to find a shorter route (this can be particularly important if the crossing is adjacent to a lightly trafficked road crossing);

Where an angled crossing (i.e. out side of the specified tolerances for a right angled crossing), is deemed practical a site specific risk assessment must be completed taking into account the following factors;

- the possibility of higher-standard surface finishes and maintenance across the tracks, or a reliable flangeway gap treatment that would reduce the problems of an angled crossing;
- the provision of adequate lines of sight when pedestrians are oriented at an angle to the track;
- the possibility of additional fencing or the realignment of approach paths to achieve a right angled crossing;
- the views of the Victorian Public Transport Access Committee or people with disabilities in the local community;
- other site specific factors.

The risk assessment will be submitted to the regulator as part of either a Notification of Change or Material Change Application dependant on the impact to the risk profile.

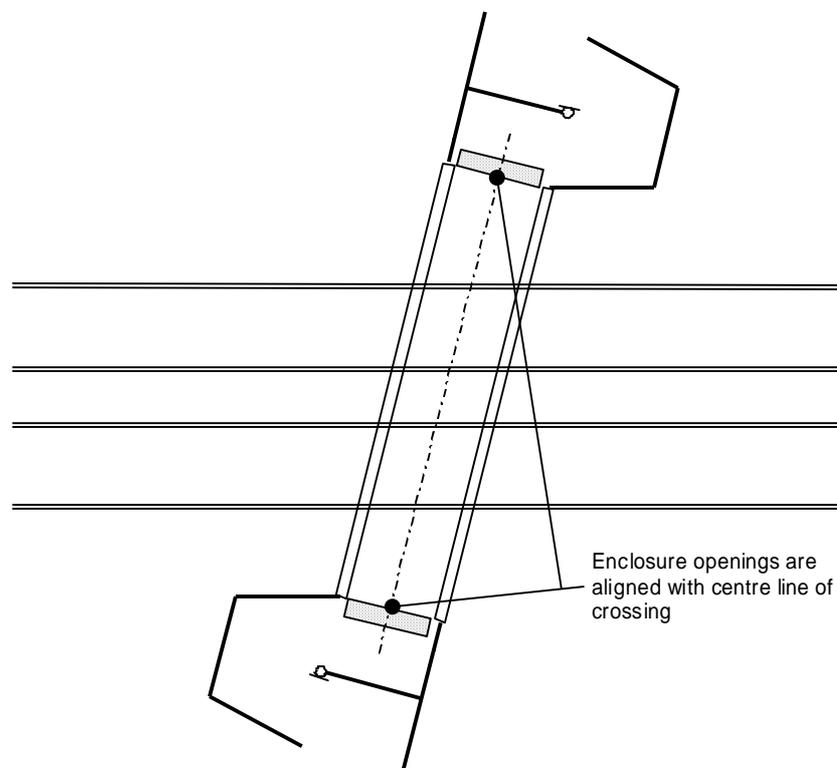
### 2.3.2 Angle of Crossing: A Note for the Melbourne Metropolitan Area

Schedule 7 of the Metropolitan Train Infrastructure Lease requires that all Pedestrian level crossings when upgraded be perpendicular to the track. This is in direct conflict with the requirements of this clause. To remedy this situation the Infrastructure Manager will seek a dispensation to Schedule 7 from the Director of Public Transport until such time as this contractual obligation is removed. A register of these Dispensations is to be maintained by the Infrastructure Manager via PASS Assets.

### 2.3.3 Orientation of Enclosures

In every case the track-side openings in the Enclosures on each side of the tracks shall squarely face each other even if the pedestrian route itself is skew to the tracks (see Figure 2). Properly aligned Enclosure openings will provide better navigational cues for sight-impaired pedestrians.

Figure 2 : Alignment of Enclosures on an Angled Crossing



## 3 Approach Paths

Approach Paths provide access from the Municipal Footpath Network to the Enclosure adjacent to the rail tracks.

### 3.1 General Requirements

Walkways, ramps and landings shall comply with AS1428.1 with the following exceptions or additional requirements.

#### 3.1.1 Width

Walkways, ramps and landings shall have an unobstructed width of not less than 1200mm.

### 3.1.2 Provision of Landings on Ramps

Ramps shall be provided with landings at the top and bottom of the ramp and at intervals not exceeding:

- for ramp gradients of 1 in 14: 9m;
- for ramp gradients of 1 in 19: 14m; and
- for ramp gradients between 1 in 19 and 1 in 14, intervals which shall be obtained by linear interpolation.
- No landings need be provided on slopes flatter than 1 in 19.

### 3.1.3 Surface Smoothness

The path is to be durable and maintainable asphalt, concrete, rubber or equivalent. It shall be free of potholes with a non-slip surface with levels no greater than  $\pm 12$ mm from the design plane when constructed.

Approach paths shall be designed so that water does not accumulate on the surface. If gratings are located in a walking surface, they shall have spaces not more than 13mm wide and not more than 150mm long. If gratings have elongated openings, they shall be placed so that the long dimension is transverse to the dominant direction of travel.

### 3.1.4 Camber and Cross fall

The camber or cross fall shall not exceed 1 in 40.

### 3.1.5 Passing areas

Passing areas must have a minimum width of 1800mm and be provided at not more than 6m intervals.

### 3.1.6 Step Ramps

If Step Ramps are provided they shall conform to AS1428.1.

### 3.1.7 Hand Rails

When an approach path leads to a pedestrian crossing that is a means of access to a public transport facility, handrails shall be provided in accordance with AS 1428.1

### 3.1.8 Continuity of Visual Clues

There should be a continuity of visual and tactile cues on the route between the municipal path and the crossing itself, for example a continuity of directional tactile ground surface indicators where they are provided on the Municipal Footpath Network.

## 3.2 Substandard Municipal Footpath Network

The condition of the adjoining Municipal Footpaths shall in no way be used to lessen the Standard that a Pedestrian Level Crossing is upgraded to. Otherwise a counter productive situation might arise where parties are not motivated to improve a substandard arrangement.

## 4 Crib Enclosures at Passive Crossings

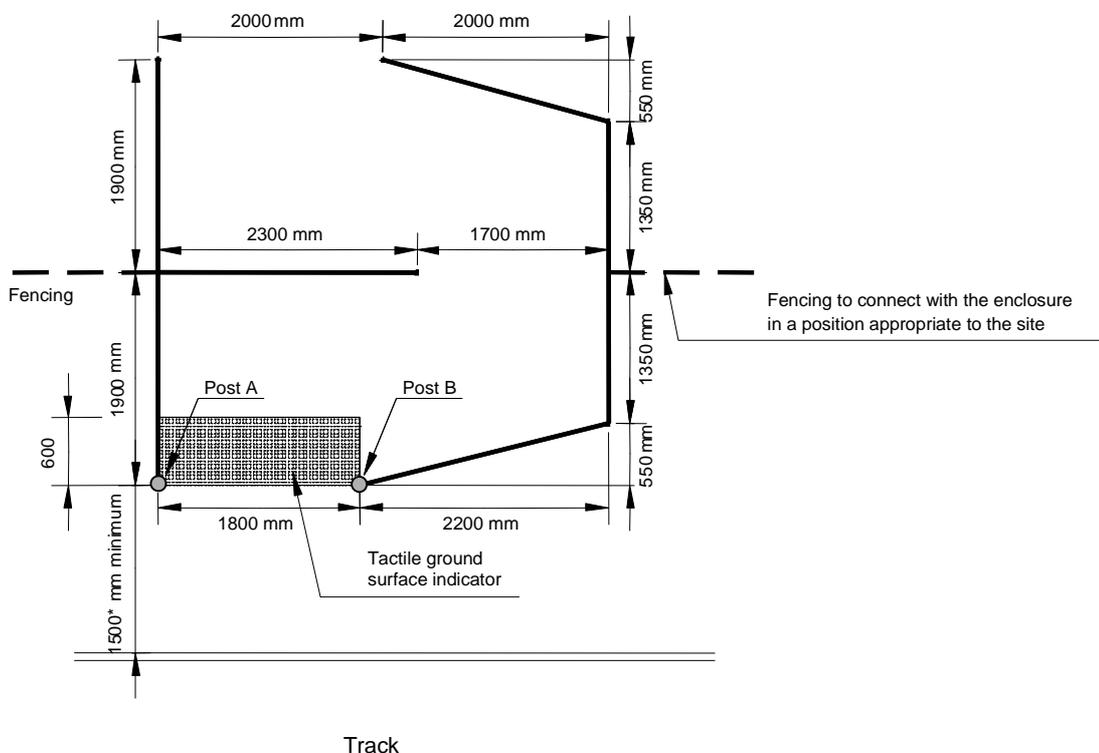
### 4.1 General

The purpose of a crib Enclosure is to direct pedestrians to face each direction before crossing the rail tracks to observe if any trains are approaching. Crib Enclosures also provide signage and directional assistance for pedestrians crossing the tracks and provide a tactile navigational aid for pedestrians with impaired vision. The design of the Enclosure shall allow the passage of the great majority of pedestrians with disabilities.

### 4.2 Surfaces

The surface smoothness shall comply with 3.1(c) and its slopes shall comply with 3.1(d).

Figure 3 : Passive Crib Crossing Layout



\* Minimum distance should be increased to allow for curve effects when the track radius is less than 600m.

\*\* All dimensions are from face to face. That is, opening dimensions are taken from the inside face of each bounding member. Structure dimensions are taken from the outside face of bounding members.

\*\*\* Part or all of posts A and B facing the rails to be painted or marked to provide a clear luminance contrast with the background. Yellow paint or chevron hazard marking is deemed to comply with this requirement.

### 4.3 Layout

The layout shown on Figure 3 shall be deemed to comply. This figure shows a layout which the pedestrian faces to the right just before crossing the tracks. This left-then-right turn should be used where possible. An alternative arrangement is the mirror image about the crossing centre line in which the pedestrian faces the left just before crossing the tracks. This latter arrangement can be used in special circumstances such as where trains predominantly approach from the left or in restricted locations where its use enables the pedestrian path to cross the track at right angles.

The crib Enclosure shall have sufficient Luminance Contrast so that it is easily distinguishable from the background.

## 4.4 Fences

### 4.4.1 Extending Fences from the Enclosure

Where feasible, fences should extend for at least 30m in each direction on each side of the Enclosure to prevent pedestrians crossing at points other than at the Enclosure. A weldmesh fence or equivalent shall be used.

### 4.4.2 Height

Fences should be sufficiently high to discourage climbing by young children but sufficiently low to avoid blocking the views of shorter pedestrians or those in wheelchairs or on scooters. It is important that the fence is able to be seen through. A height of 1200mm of an open weld mesh material is deemed to comply.

### 4.4.3 Horizontal Elements

If exposed to high speed road traffic (say 50km/h or above), fences shall not be a hazard to the occupants of errant vehicles. They should not have horizontal elements that could spear an impacting vehicle.

## 4.5 Signs and Pavement Markings

The following shall apply to each passive crossing.

### 4.5.1 Warning Signs

Table 1 lists the warning signs used at Passive Crossings.

**Sign A** should be erected on the centre barrier fence of the crib where the crossing is in an isolated location or adjacent to a road crossing controlled by a stop or give way sign.

**Sign B** should be used at locations when an adjacent road crossing is equipped with flashing lights and bells. The size of the signs shall comply with the intent of the Disability Standards for Accessible Public Transport.

**Sign C** shall be used at all pedestrian and exclusive use bicycle crossings other than active control gated crossings. The details of this sign are shown in AS1742.1. They shall be located on the non-trackside approach.

Sign	VicTrack Plan Numbers	Sign Legend
A	STD_Rtba.dgn Rev - -	
B	STD_Rtba.dgn Rev - -	



#### 4.5.2 Luminance Contrast

Where the central fence does not include a sign and there is insufficient Luminance Contrast to clearly distinguish the fence from the background, the central fence could include chevron marking or other sign to assist pedestrians who have limited vision.

#### 4.5.3 Complaint Signs

Signs should be placed at the crossing with a telephone number so that members of the public can register complaints. The sign shall contain a unique location number for identification.

#### 4.5.4 Pavement Marking

The tactile ground surface indicators shall be located as shown in Figure 3. Tactile ground surface indicators and pavement markings shall be in a contrasting colour with a minimum Luminance Contrast complying with the Disability Standards for Accessible Public Transport (2002).

### 4.6 Mid-Crossing Enclosures

When the crossing is over more than one track, and there is sufficient space between tracks, a mid crossing enclosure shall be considered. Where a mid-crossing enclosure is to be provided, its warnings and its signage should reflect the design of the outside Enclosures. Cross track pairs of gates shall operate in synchrony but independently of the other cross track pair.

### 4.7 Heritage Considerations

The crossing shall provide compliant layouts and materials without detracting from the local amenity where possible.

## 5 Gated Crossing Enclosures at Active Crossings

### 5.1 Surfaces

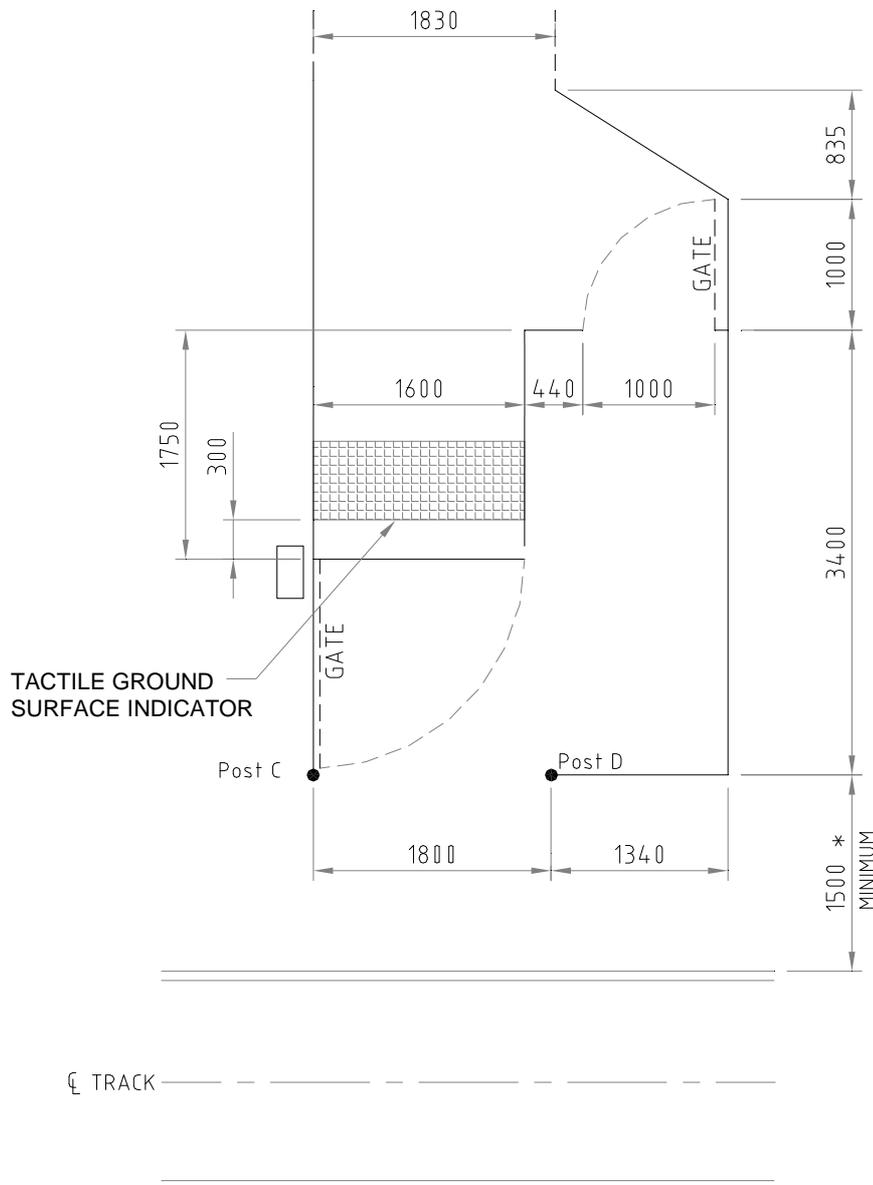
The surface smoothness shall comply with 3.1(c) and its slopes shall comply with 3.1(d).

### 5.2 Layout

The layout shall conform to that shown in Figure 4.

When the track radius is less than 600m the distance from the nearest rail to the nearest fence of the enclosure shall be greater than 1500mm to allow for curve effects.

Figure 4 : Active Crossing Layout- Preferred Design



\* Minimum distance should be increased to allow for curve effects when the track radius is less than 600m.

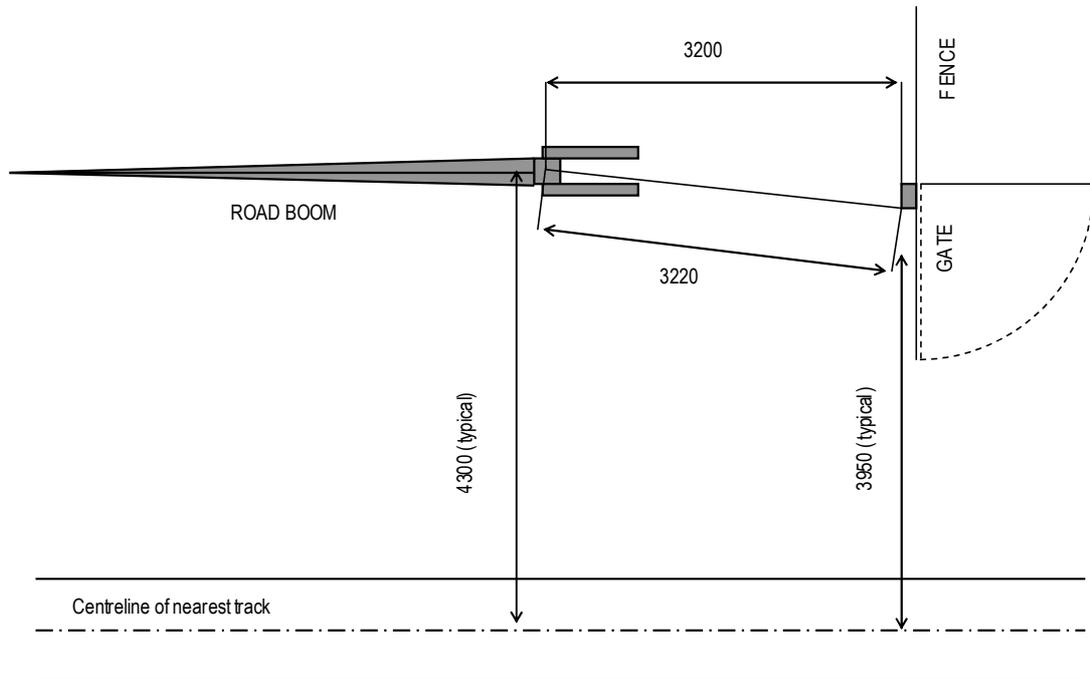
All dimensions are from face to face. That is opening dimensions are taken from the inside face of each bounding member. Structure dimensions are taken from the outside face of bounding members.

Part or all of posts C and D facing the rails to be painted or marked to provide a clear luminance contrast with the background. Yellow paint or chevron hazard marking is deemed to comply with this requirement.

### 5.2.1 Clearance to Adjacent Road Booms

In some cases the gate motor would be located close to a road boom barrier. Figure 5 shows the normal minimum clearances to ensure acceptable levels of safety for maintenance staff working on both pieces of equipment for the case when the boom and the gate motor would be located in the same enclosed space.

Figure 5 : Normal Minimum Clearances- Preferred Enclosure Layout



### 5.2.2 Reduction in Clearance to Adjacent Road Booms

The clearances shown in Figure 5 may be reduced if it can be shown that equivalent levels of maintenance worker safety would still be maintained. Techniques that may be used to reduce these clearances include the following.

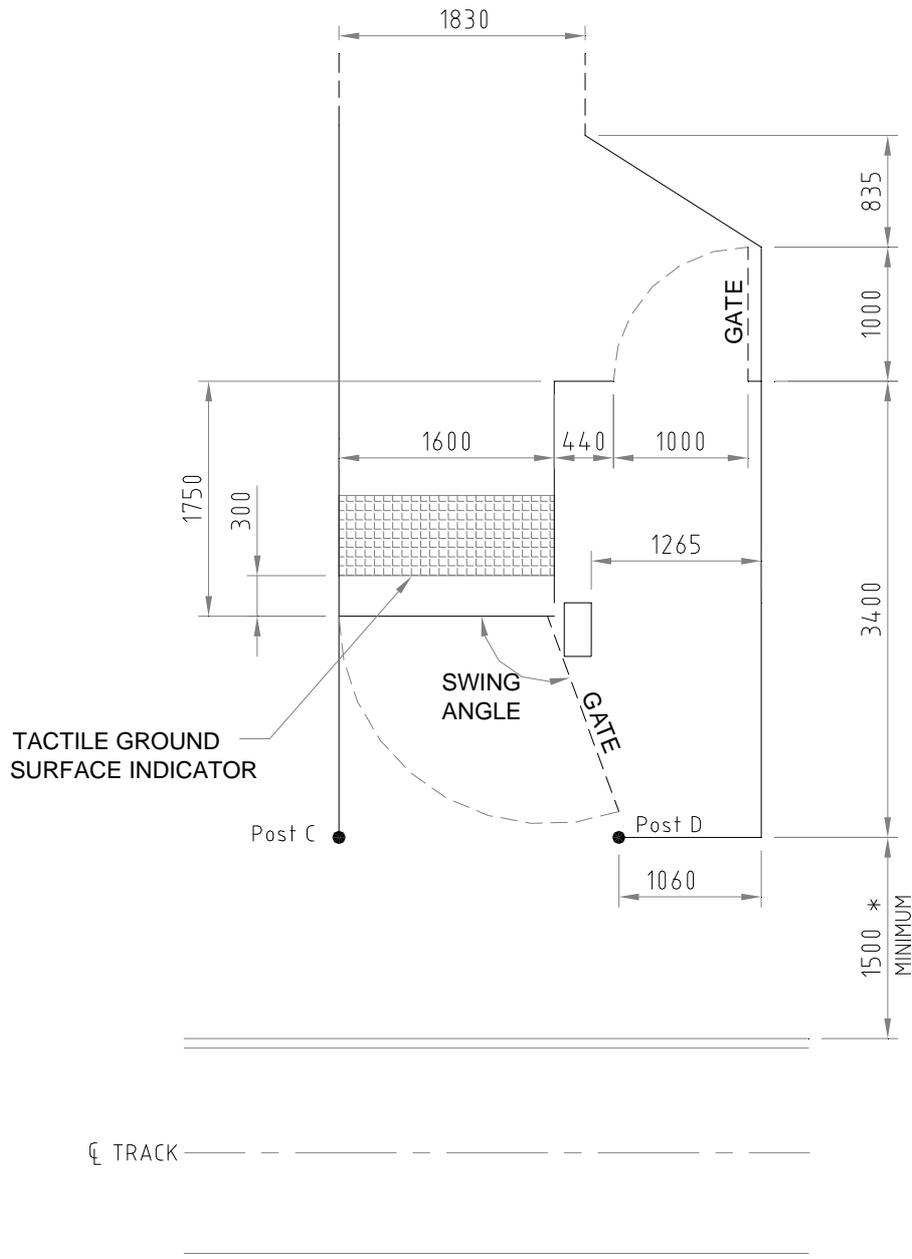
- Use of a shorter and heavier boom counterweight.
- Application of a machine guard around the outer end of the boom counterweight.
- Special safety procedures applied to staff undertaking maintenance.
- Increasing the difference between the offset from the rail track of the gate motor and the offset to the road boom. Oblique crossings will increase (or decrease) the effective lateral offset of the outer end of the boom counterweight depending on whether the angle is greater or less than 90 degrees.

### 5.3 Alternative Enclosure Design

Figure 6 shows an alternative Active Crossing layout with the gate motor in the escape path. This layout is deemed to be acceptable only where site specific circumstances prevent the adoption of the preferred layout. The alternative layout incorporates a motorised gate with the hinge on the side of the escape path.

If a boom mast is located nearby a minimum clearance of 2m is required from the enclosure fence to the boom mast. This is required to ensure adequate clearance to the movement of the road boom counterweight. This clearance can only be reduced in special circumstances by measures such as those outlined in Clause 5.2 (b).

Figure 6 : Alternative Active Crossing Layout



\* Minimum distance should be increased to allow for curve effects when the track radius is less than 600m.

All dimensions are from face to face. That is opening dimensions are taken from the inside face of each bounding member. Structure dimensions are taken from the outside face of bounding members.

Part or all of posts C and D facing the rails to be painted or marked to provide a clear luminance contrast with the background. Yellow paint or chevron hazard marking is deemed to comply with this requirement.

The swing angle of the gate shown in the diagram is 108 degrees. If the swing of the actual gate is less than this the outer vertical edge of the gate should be marked as described for post D and marking for post D omitted.

## 5.4 Fences

Fences shall comply with 4.4.

## 5.5 Signs and Pavement Markings

### 5.5.1 Warning signs

**Sign B** in 4.5(a) shall be mounted facing the Approach Path.

**Sign D** shall be mounted on the emergency exit gate facing the tracks.

**Sign E** shall be mounted on the emergency exit gate facing the Approach Path.

**Sign F** shall be mounted on the trackside of the motorised gate.

Sign	VicTrack Plan Numbers	Sign Legend
D	STD_Rtba.dgn Rev - -	
E	STD_Rtba.dgn Rev - -	
F	STD_Rtba.dgn Rev - -	

**Table 1: Warning Signs at Active Crossings**

### 5.5.2 Luminance Contrast

In cases where the gate has insufficient Luminance Contrast to distinguish it from the background, then chevron markings could be used.

### 5.5.3 Complaint Signs

Complaint signs should comply with 4.5(c).

### 5.5.4 Pavement Marking

No painting of the pavement is required if the raised pavement markers are placed as shown in Section 6.4.

## 5.6 Mid-Crossing Enclosures

When the crossing is over more than one track, and there is sufficient space between tracks, a mid crossing enclosure shall be considered. Where a mid-crossing enclosure is to be provided, its warnings and its signage should reflect the design of the outside Enclosures. Cross track pairs of gates shall operate in synchrony but independently of the other cross track pair.

## 5.7 Heritage Considerations

The crossing shall provide compliant layouts and materials without detracting from the local amenity where possible.

## 5.8 Latches on the Exit Gate of the Escape Path

The purpose of the latch is to inhibit wrong way entry by pedestrians who wish to bypass the gate when a train is approaching. Ideally they should be readily operated by pedestrians of all abilities when legitimately exiting the escape path in the opposite direction. As far as possible, latch designs should be consistent across the rail network. Current practice may be continued or alternatively spring loaded hinged gates may be used until a suitable latch is available.

# 6 Crossing of Rail Tracks

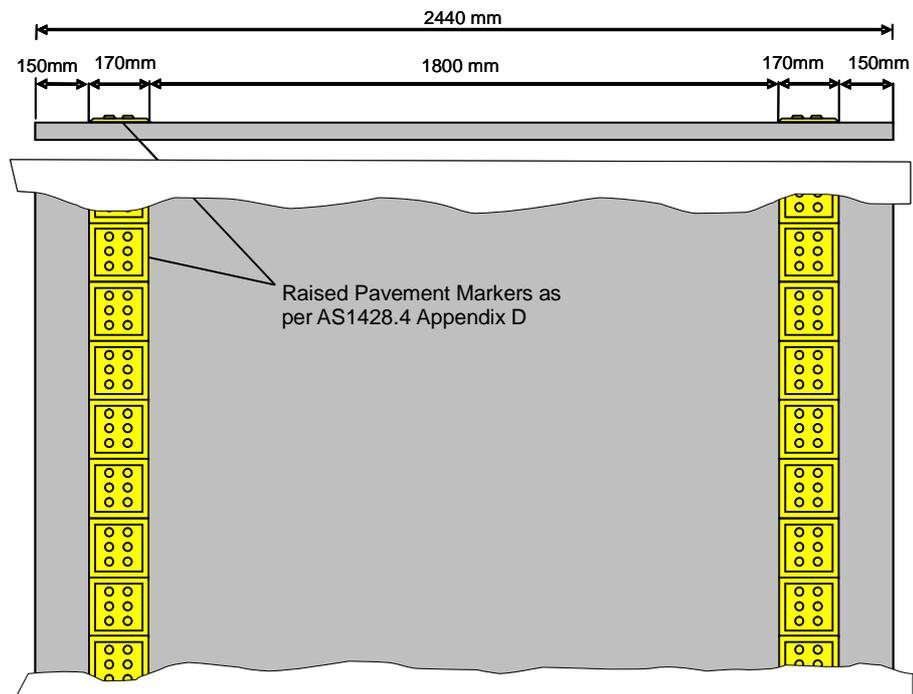
## 6.1 General

The details of the crossing of the tracks themselves are most critical to feelings of danger and of safety especially for pedestrians with disabilities.

## 6.2 Layout

The minimum width of the path across the rail tracks shall be as shown in Figure 7.

Figure 7 : Layout of Track Crossing



## 6.3 Surfaces

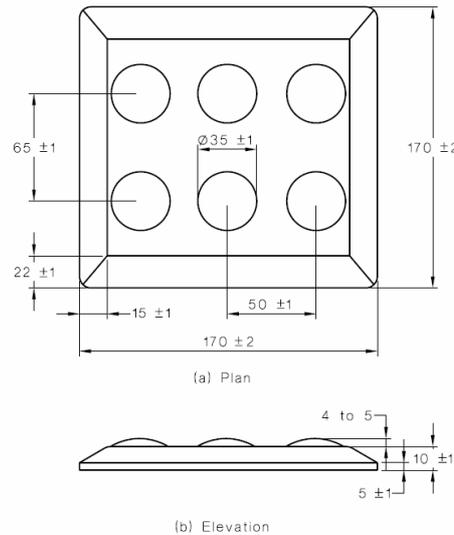
The surface smoothness shall comply with 3.1(c) and its slopes shall comply with 3.1(d). Particular attention should be taken of tripping hazards where the crossing is on a curve with different rail levels.

## 6.4 Pavement Markings

### 6.4.1 Raised Pavement Markers

The edge markers shall be sufficiently high and wide to enable a cane user to locate the edge of the crossing. The arrangement shown on Figure 7 is deemed to comply with this requirement. The use of raised yellow markers is preferred. The dimensions of raised pavement markings should be as shown in Figure 8, as adopted from AS1428.4.

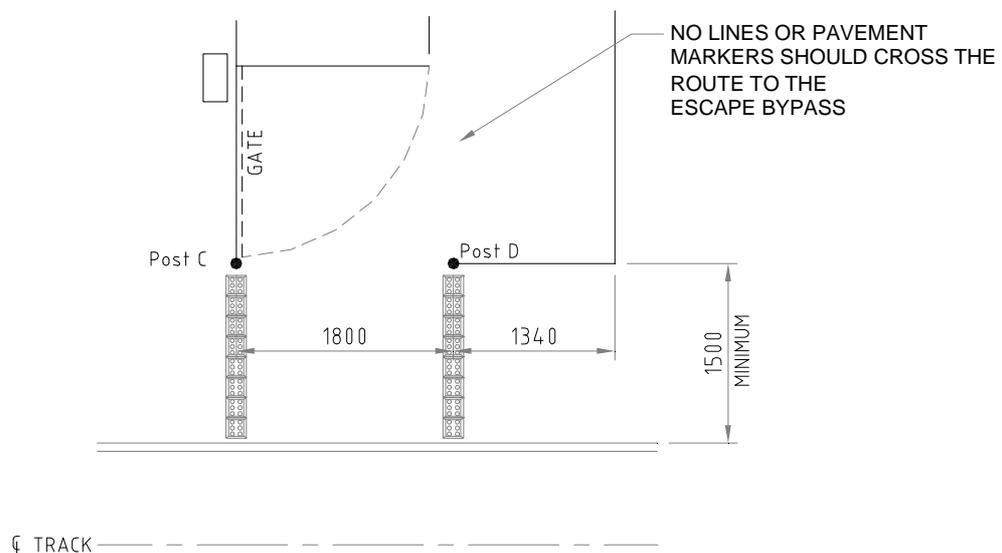
Figure 8 : Raised Pavement Markers



### 6.4.2 Location of Pavement Markers

In cases where there is an escape path at the active crossing, no lines or pavement markers should cross the route to the escape bypass. The layout of these tiles should be as shown in Figure 9.

Figure 9 : Location of Raised Pavement Markers



## 6.5 Edge Line Continuity to the Enclosure

In some cases the width of the Enclosure facing the crossing of the tracks will be slightly different from the width between the edge lines of the crossing itself. In these cases the contrasting edge lines of the crossing should taper to the end posts of the Enclosure to help guide sight-impaired pedestrians.

## 6.6 Panel Crossing Units

Crossing panels provide many benefits in terms of facilitating disabled access as well as adding the ability to be temporarily removed during track reconstruction. They are not appropriate in all instances and should be avoided where the adjacent –

- track contains an Insulated Rail Joint
- track radius is less than 800 m
- track's rail weight and sleeper type combination are not suitable.

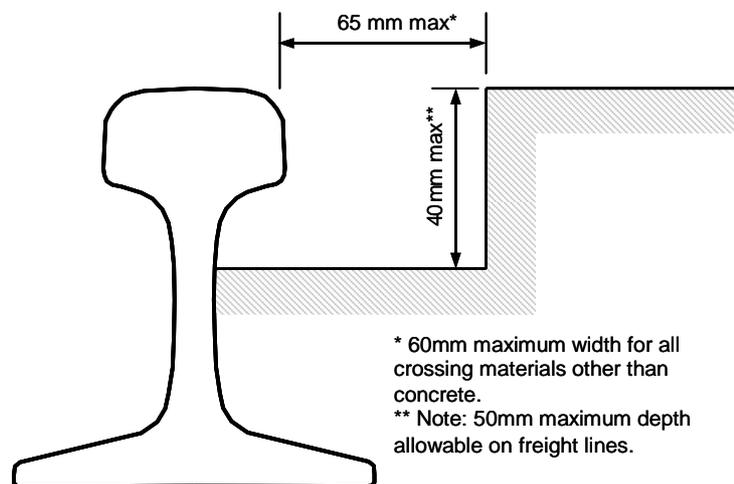
## 6.7 Flangeway Gaps

The passage of trains rely on a minimum sized gap beside the rail to allow space for the wheel flange. However flangeway gaps represent a hazard to small-wheeled mobility aids. Once trapped within the gap, some users find the wheel very difficult to extract. The maximum gap sizes are shown in Figure 10.

The top of the path surface should be level with the top of the rail, noting that if some misalignment is unavoidable it is preferable to disabled users to have the rail level slightly higher than the crossing surface level.

The flangeway gap width must be continuous across the crossing width. The base of the flangeway gap must also be of a continuous depth being free from holes, slots and grooves.

**Figure 10 : Maximum Flangeway Gap Dimensions**



## 7 Warning Signals at Active Crossings

Warnings signals alert pedestrians to approaching trains. They require real-time train detection. Many pedestrians have visual and hearing deficiencies that impair their ability to respond.

### 7.1 Visual Warnings

At present there are a variety of signals that are used in Victoria, including flashing lights. In future it is likely that AS1742.7 will specify the following visual signals be used at all active pedestrian crossings. They would be located to face pedestrians at the gate position or if there is no gate, the point behind which they should wait safely clear of a passing train. Design requirements for signal lanterns are specified in AS2144.

Until that time there is no requirement for an active visual warning.

#### 7.1.1 Red Symbolic Standing Pedestrian Signal

The signal shown in Figure 11 would display a steady red man during the approach and the passage of the train. It would be preceded by a flashing warning period. It would be switched off at other times.

Figure 11: Red Symbolic Standing Pedestrian Signal



#### 7.1.2 Another Train Coming

An illuminated 'another train coming' sign similar to that shown in Figure 12 could be added to all crossings with active control of pedestrian traffic, including gated crossings. The sign would be displayed when there would be no opening of the crossing between successive trains.

Figure 12 : 'Another Train Coming' Illuminated Sign



### 7.2 Aural Warnings

A single frequency (800hz) output signal pulsating on and off at ¼ second intervals shall be fitted to the inside of the pedestrian gate mechanism or mounted on a vandal resistant enclosure near the gate mechanism. A Yodalarm Type YO3, 110 VAC supplied by Radio Spares, or equivalent, is deemed to comply.

## 8 Lighting

Crossings at metropolitan railway stations should have a minimum level of lighting of 50 lux. Care should be taken to avoid light dazzling the eyes of train drivers.

Where crossings have been upgraded the existing lighting arrangements shall be retained. However if the design of the crossing is altered as part of the upgrade and introduces any additional hazard to users the level of lighting will be increased to mitigate that risk.

## 9 Conventions

- 1) Words or phrases that appear capitalised out of context, are defined within the. Definitions section of this VRIOG Standard.
- 2) The work “Shall” is to be understood as mandatory.
- 3) The work “Should” is to be understood as non-mandatory i.e. advisory or recommended.
- 4) Uncontrolled Standards may not be referenced within the VRIOG Standards. These include former PTC Standards, Franchisee Standards, Franchisee Subcontractor Standards and Infrastructure Lessee Standards.
- 5) Controlled Standards, including Australian Standards and other VRIOG Standards, may be referenced but only if :
  - The referenced item can not be adequately explained with an amount of text that could not reasonably be inserted into the body of the Standard.
  - The reader is not referenced to another Controlled Standard necessary for the item to be adequately explained i.e. one document link only.
  - The referenced document is a Figure or table and could not reasonably be included in the appendices of the Standard
- 6) The format employed in the VRIOG Standards is compatible with Australian Standards, and will be used from this point on.
- 7) The numbering system for the VRIOG Standards is chronologically sequential from the point of introduction, and is not based on any form of interpretive system. The year of introduction of a VRIOG Standard is included as a suffix to the numbering system, and will be altered on revision of the Standard to the year of introduction of that revision.
- 8) The VRIOG Standards contain engineering information necessary to operate a safe Railway. VRIOG Standards will not contain any information that can be construed as a work instruction, procedure, process or protocol. This information forms the basis of each individual entity’s Safety Accreditation Certification, and, as such, is outside the scope of VRIOG Standards.