UGL REGIONAL LINX

Level Crossings

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CRN CS 520

LINKING COMMUNITIES. CONNECTING CUSTOMERS.

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Document Control

Function	Position	Name	Date
Approver	A&E Manager	Lucio Favotto	27.01.2022

Revision	Issue Date	Revision Description
1.3.	27.01.2021	UGLRL Operational Standards Template applied
2.0	27.01.2021	First approved and issued UGLRL version

Summary of changes made from previous version

Section	Summary of change
All	This document is based on the previous rail infrastructure maintainer (RIM). Full revision history is available on request from UGLRL.

1 Purpose, scope and application

This Standard establishes design and installation requirements, acceptance standards and damage limits for level crossings, and requirements for passive control treatments at level crossings on the Country Regional Network (CRN).

It applies to road, pedestrian and service level crossings. Service level crossings include track vehicle access points.

It does not provide requirements for active control treatments at level crossings.

2 References

2.1 Australian and International Standards

AS 115	Lighting for roads and public spaces
AS 1428	Design for access and mobility
AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction and installation
AS 1742.7	Manual of uniform traffic control devices Part 7: Railway crossings
AS 1743	Road signs - Specifications
AS 2150	Hot mix asphalt – A guide to good practice
AS 4586	Slip resistance classification of new pedestrian surface materials
AS 5100	Bridge design

2.2 CRN documents

CRN CS 100	Civil Technical Maintenance Plan
CRN CS 210	Track Geometry and Stability
CRN CS 240	Ballast
CRN CS 320	Overbridges and Footbridges
CRN CS 410	Formation and Earthworks
CRN CS 420	Track Drainage
CRN CM 521	Level Crossings
CRN CP 213	Trackside Signs
CRN SD 018	Signal Design Principles – Level Crossings
CRN SC 017	Level Crossing Equipment
CV0169390	Guard angles for asphaltic concrete type level crossings
CC000234	Concrete level crossing with steel guard angles
CC000033	Steel Level Crossing Panels for use with steel sleepers
CC000436	Standard Asphalt level crossing
CC000437	Pedestrian Asphalt level crossing

2.3 Other references

AGRD02-19	Guide to Road Design Part 2: Design considerations
AGRD03-16	Guide to Road Design Part 3: Geometric design
AGRD04-17	Guide to Road Design Part 4: Intersections and crossings

AGRD06A-17	Guide to Road Design Part 6A: Paths for Walking and Cycling
AGPT02-17	Guide to Pavement Technology Part 2: Pavement Structural Design
	Roads Act 1993

2.4 Definitions

The following defined terms are used throughout this standard:

Level Crossing:	A crossing provided for road motor vehicles, pedestrians and/or livestock traffic to cross rail tracks at grade. May also provide an access point for on and off tracking combination road/rail vehicles.
Road Level Crossing:	A level crossing provided for road vehicles to cross the track.
Public Level Crossing:	A Level Crossing provided to maintain continuity of a public thoroughfare. Public Level Crossings are available for the use of the general public.
Pedestrian Level Crossing:	A level crossing provided for pedestrians to cross the track.
Private Level Crossing:	A Level Crossing provided to permit access to private property or to extend access between parts of private property. Private Level Crossings are for the use of property holders and their nominees and are not available for public access.
Service Level Crossing:	A level crossing provided for UGLRL CRN staff and persons authorised by UGLRL CRN to cross the track. Service level crossings may be provided at station platforms, in depots and station yards and in field situations for maintenance access. Service level crossings may be permanent or temporary.
Level Crossing Structure:	An installation, including the associated support system, providing a continuation of the road/pedestrian pavement to enable road vehicles/pedestrians to cross the railway at grade.
Modular Level Crossing:	A level crossing manufactured in concrete or rubber modular sections and assembled on site.
Panel:	The individual component in a manufactured level crossing structure.
Pedestrian Enclosure:	Fenced area to guide pedestrians on the approach to pedestrian level crossings. Includes a maze arrangement for passive control crossings, and a swing gate for active control crossings.
Active Control:	Control of the movement of vehicular or pedestrian traffic across a railway level crossing by devices such as flashing light signals, gates or barriers, or a combination of these, where the device is actuated prior to and during the passage of a train through the crossing.
Passive Control:	Control of the movement of vehicular or pedestrian traffic across a railway level crossing by signs and devices, none of which are activated during the approach or passage of a train, and which rely on the road user or pedestrian detecting the approach or presence of a train by direct observation.
Authorised Person:	A person authorised by UGLRL CRN or its agents to enter onto and cross rail tracks at a Service Level Crossing.
Main Road:	A State or Regional Road maintained by the NSW Roads and Maritime Services.
Road Authority:	The entity responsible for the road that the Level Crossing accommodates.

For public roads, the Road Authority is usually the NSW Roads and Maritime Services or the local council.

For private roads, the Road Authority is usually the landowner

See relevant CRN standards for definitions of other terms.

3 Engineering authority

Design and selection of infrastructure detailed in this standard for use on the CRN may only be undertaken by persons who have been granted appropriate Engineering Authority by the Principal Track and Civil Engineer

4 Functional requirements

Level crossings are installed to provide a safe track crossing, at grade, for road, pedestrian and stock traffic. Level crossings also provide access to the track for road/rail vehicles.

A safe crossing equates to the ability to:

- warn users (rail, road and pedestrian users) of the existence of a level crossing
- warn users of the approach of conflicting traffic with sufficient time for protective action to be taken
- allow for the passage of specified (size, weight and speed) road, rail and pedestrian traffic.

5 Design requirements

5.1 General

The design of new and upgraded level crossings shall be based on the requirements specified in this document with the type of level crossing structure being selected based on site specific and asset management requirements.

- Designs shall include:
- crossing structure suitable for the traffic loads
- provision of a flangeway for train wheels
- guard rails (where required)
- end restraints for panels (where required)
- skid resistant road surface
- slip resistant pedestrian surface
- provision for surface water to flow away from the crossing
- track drainage
- interface with the track structure
- interface with the track geometry
- reliable insulation so as not to interfere with track circuits for signalling, including for typical in-service situations
- traffic control treatments.

The level crossing structure at a location shall be of consistent type and material. There should not be a mix of panels and full depth construction, nor a mix of panel material type.

The design of control treatments at level crossings shall be based on AS 1742.7 “Manual of uniform traffic control devices Part 7: Railway crossings” and the requirements specified in this document.

The design of pedestrian level crossings shall comply with the requirements of AS 1742.7 and AS 1428.2.

The track at the level crossing shall comply with relevant CRN Engineering Standards and Specifications.

5.2 Location

Level crossings shall be located clear of:

- the length of track occupied by trains standing at railway signals
- turnouts and insulated joints.

In addition, passive control level crossings shall be located in accordance with the sight distance requirements detailed in this standard and clear of existing installations which restrict sight distance.

Level crossings should not be located on curves.

The location of a level crossing shall be reviewed by an authorised track designer with respect to the track geometry. The track levels, superelevation and vertical grading of the track are important considerations in the design of the level crossing and the design of the interface between the track and the level crossing surface.

5.3 Design loads

Level crossing structure designs shall be based on the traffic using the crossing.

Road pavement level crossings shall be designed in accordance with Austroads publication “Guide to Pavement Technology Part 2: Pavement Structural Design”

Road modular level crossings shall be designed to carry the traffic loads as specified in AS 5100.2 ”Bridge design - Design loads”.

Track vehicle access crossings shall be designed for the range of vehicles using the crossing to access the track. The minimum design load shall be the R20 truck – see CRN Engineering Standard CRN CS 320 “Overbridges and Footbridges” for details of R loading configuration. If heavy construction equipment is to use the crossing, the crossing shall be designed as a road level crossing.

Pedestrian level crossings shall be designed to carry pedestrian loads and, where relevant, traffic loads from vehicles travelling along the rail corridor which may drive over the crossing. The minimum load shall be the pedestrian loads in AS 5100.2. The minimum traffic load shall be the R20 truck.

In yards and sidings only, service pedestrian level crossings may be designed for the walkway loads in AS 1657 “Fixed platforms, walkways, stairways and ladders – Design, construction and installation”.

5.4 Flangeways

Level crossings shall be designed to provide a clearance to the running rail for train wheel flanges. Specifically:

- Level crossings shall have a minimum flangeway clearance of 60 mm
- Pedestrian level crossings shall have a maximum flangeway clearance of 65mm
- Pedestrian level crossings shall have a maximum depth of 50 mm.

5.4.1 Flangeway Seals

Due to the expected design life of 15 years, flangeway seals should not be used on level crossings on state roads such as freeways, highways and main roads that cross the CRN and which form the primary network of carrying traffic around the regional centres of NSW.

Flangeway seals shall not be used on level crossing located on curves which are subject to curve wear

Where flangeway seals are utilised, they shall not extend beyond the length of the level crossing.

Approved flangeway seal products are listed in Appendix 1.

5.5 Guard rails

Guard rails should be provided on level crossings located on curves with radius < 400 m.

Guard rails shall be provided on level crossings located on curves which are subject to curve wear.

Guard rails shall be provided with a flare and increase the flangeway to a minimum of 85 mm at a rate of 1:8.5. The flare shall commence outside of the level crossing area.

Bolt holes in the rail for guard rails shall be spaced to ensure the bolt holes are located mid sleeper bay.

The top of the guard rail shall be level with the top of the running rail.

Approved designs for guard rails are detailed in CC000436 for asphalt level crossings and CC000234 for concrete level crossings.

5.6 Surface material

5.6.1 Asphalt level crossings

Asphalt for level crossings shall be designed and installed in accordance with AS 2150 “Hot mix asphalt – A guide to good practice”.

Road level crossings shall use an asphaltic concrete mix for heavy traffic wearing course applications.

Pedestrian level crossings shall use an asphaltic concrete mix for light traffic wearing course applications.

Service level crossings shall use an appropriate asphaltic concrete mix based on the traffic load on the crossing.

Approved designs are detailed in CC000436 for road level crossings and CC000437 for pedestrian level crossings.

5.6.2 Modular level crossings

5.6.2.1 General

The level crossing structure shall consist of internal panels to span between the rails of an individual track and external panels for a distance not less than 580 mm outside each rail of that track.

Larger external panels may be designed to span the entire space between adjacent tracks.

The internal panels and the edge of external panels parallel to and adjacent to the rails may be supported either by the track structure or from the rails.

The edge of external panels parallel to and remote from the rails may be supported either by the pavement subgrade or an independent edge beam. Where an edge beam is not used, the road surface abutting the crossing shall be provided with an edge and support independent of the

external panels to the level crossing surface system to enable removal of the external panel(s) without damage to the abutting road or footpath surfacing.

Panels shall be properly secured by end restraints.

The panels shall provide a crossing surface which is devoid of any pedestrian tripping hazards.

The panels shall butt up securely in the longitudinal direction so as not to create a hazard for wheelchairs and bicycles.

The level crossing structure shall be designed so that it can be removed, and reinstalled or replaced, either for replacement purposes or to gain access to the track for maintenance or inspection without damage to the component parts of the level crossing structure.

There shall be no appreciable degradation of performance of the level crossing structure under weather conditions to be expected in NSW.

Level crossing panels for use in track circuited locations shall not have steel edges that extend fully around the panel because of the potential for shorting track circuits.

5.6.2.2 Constraints on use of panels for road crossings

The suitability of panels depends on road vehicle speed and other factors such as the presence of impact initiators and the angle of the road crossing the track.

All modular panels shall be selected based on the track and road configuration. Modular panel crossings require Approval from the Principal Track and Civil Engineer unless otherwise approved where

- The road speed exceeds 80km/h
- The angle of the road crossing to the track is more acute than 30°
- The track curve radius is < 400m

5.6.2.3 Additional constraints on use of steel panels for road crossings

Steel panels may only be installed in low speed, low usage private, public and service road level crossings.

The Principal Track and Civil Engineer shall approve use of steel panels on public road crossings.

Approved designs are detailed in CC000033 for steel level crossing panels.

5.6.3 Unsealed Road Surface

All newly designed and installed unsealed road surface consists of

- Guard rails are to be provided as per drawing CC000436-03
- Full depth road base compacted in layers not more than 150mm,
- Bitumen emulsion sprayed on all steel surfaces
- Suitable geotextile material provided between the ballast and the road material.

6 Configuration requirements

6.1 Public road level crossings

6.1.1 Crossing configurations

Approved configurations for use in public level crossings are:

- Asphaltic concrete,

- concrete
- concrete panel,
- unsealed road surface
- steel panel

New unsealed road surfaces are only approved for temporary road diversions

Where road base containing any material that may contaminate the ballast is used it shall be separated from the ballast by a suitable geotextile.

All steel surfaces e.g. rail and fastenings in contact with the road material shall be sprayed with bitumen emulsion.

The surface runoff shall be directed away from the track structure.

The approach road construction shall not interfere with the track and cess drainage.

6.1.2 Crossing width

The width of the level crossing shall be determined in consultation with the Road Authority to accommodate the largest vehicle using the crossing.

The width of the crossing and the approaches shall be constant.

Where reasonably practicable, the intersection between road and railway shall be at right angles.

6.1.3 Crossing surface

The level crossing surface shall be level with the rail surface and plane between the two rails. For multiple tracks, the level crossing surface shall be plane between each adjacent pair of rails.

The road surface shall be no higher than the rail level.

The crossing surface shall be stable under acceleration, braking and turning forces without undue vertical displacement or horizontal movement.

The crossing surface shall be designed to prevent the formation of standing water.

Level crossings shall have a skid resistant surface. The skid resistance value for public level crossings shall be similar to the value for the adjacent road surface.

To prevent flangeway contamination and provide skid resistance, for the road surface adjacent to a public crossing shall be a sealed extending from the track either 7m or to the rail corridor boundary, whichever distance is the shortest.

6.1.4 Vertical road profile

The vertical road profile at the crossing and its approaches shall be in accordance with the Austroads 2017 publication Guide to Road Design Part 4: Intersections and Crossings – General.

The approach grades to the crossing within the railway reserve should be level, but shall not exceed 1 in 8.

6.1.5 Other requirements

Pavement markings shall be in accordance with AS 1742.7.

For passive control crossings, fences shall be designed to not restrict a road vehicle driver's line of sight to an oncoming train.

The risk of stock entering the rail corridor at the level crossing shall be assessed. Where the risk assessment determines that they are necessary, cattle stops shall be provided.

6.2 Private road level crossings

6.2.1 Crossing configurations

Approved configurations, in addition to the configurations in Section 6.1.1, are:

- unsealed road surface
- asphalt
- steel panel

Where road base containing any material that may contaminate the ballast is used it shall be separated from the ballast by a suitable geotextile.

All steel surfaces e.g. rail and fastenings in contact with the road material shall be sprayed with bitumen emulsion.

The surface runoff shall be directed away from the track structure.

The approach road construction shall not interfere with the track and cess drainage.

6.2.2 Crossing width

The design width of a Private Level Crossing shall suit the reasonable requirements of the user. It should be able to accommodate the largest vehicle using the crossing.

The minimum width of road surface for private level crossings shall be 4.5m.

Where reasonably practicable, the intersection between road and railway shall be at right angles.

6.2.3 Crossing surface

The level crossing surface shall be level with the rail surface and plane between the two rails. For multiple tracks, the level crossing surface shall be plane between each adjacent pair of rails.

The road surface shall be no higher than the rail level.

The crossing surface shall be stable under acceleration, braking and turning forces without undue vertical displacement or horizontal movement.

The crossing surface shall be designed to prevent the formation of standing water.

The minimum requirement for road surface adjacent to a private crossing shall be a formed gravel road extending from the track either 7m or to the rail corridor boundary, whichever distance is the shortest.

Where Passive Control with Give Way signs is proposed, the design maximum design speed shall be 60km/h

6.2.4 Vertical road profile

The vertical road profile at the crossing and its approaches shall be in accordance with the Austroads 2017 publication Guide to Road Design Part 4: Intersections and Crossings – General.

The approach grades to the crossing within the railway reserve should be level, but shall not exceed 1 in 8.

6.2.5 Other

At new private level crossings, gates or cattle grids shall be placed in the boundary fence. Gates shall be kept closed and locked except when opened for road vehicle passage.

For existing Private Level Crossings, the provisions of Section 6.1.5 apply.

6.3 Pedestrian level crossings (public)

6.3.1 General

Pedestrian level crossings shall comply with the requirements of AS 1742.7.

The minimum width of the level crossing shall be 3000 mm (1800mm for walkway and 600mm each side for tactile installation).

Where reasonably practicable, the intersection between footpath and railway shall be at right angles.

Selection of pedestrian protection requirements shall be determined in accordance with CRN Engineering Standard CRN SD 018 “Signal Design Principles – Level Crossings”

6.3.2 Approach footpath

Walkways are to be designed in accordance with AS 1428.1, the Building Code of Australia requirements, and the below specific requirements.

- The approach footpath within the enclosure or maze area at no point is to slope towards the track.
- From front of maze/enclosure to near rail:
  - slope to range from level to 1 in 40 uphill towards the rail.
- Within the enclosure/maze:
  - From front of maze/enclosure to 1.5 metres behind the gate: preferably level, but slope to range rom level to 1 in 40 uphill towards the track.
  - From 1.5 metres behind the gate to back of maze/enclosure: preferably level, but slope to range from level to 1 in 40 uphill towards the track.

6.3.3 Walkway across the tracks

The walkway surface across the tracks shall be plane with the rail surface between sleeper ends.

The change in level between the rail and the adjacent footpath shall be not more than 5 mm.

The walkway surface should be level.

On curved track, maximum allowable superelevation applied to the track is 75mm, which equates to a walkway slope of not more than 1 in 20.

The walkway slope shall be constant between sleeper ends on each track, and between ends of sleepers on adjacent tracks.

6.3.4 Crossing surface

The crossing surface shall be designed to prevent the formation of standing water and shall have a maximum crossfall of 1 in 40.

The walkway surface material classification according to the wet pendulum test shall be Class V in accordance with AS 4586 “Slip Resistance Classification of New Pedestrian Surface Materials”.

6.3.5 Pedestrian crossing structure configurations

Approved pedestrian level crossing structure configurations are:

- asphaltic concrete
- concrete
- concrete panel

- rubber panel

6.3.6 Other

Walkway shoulders on the level crossing structure and access points to the track shall have hazard tactile warning strips in accordance with AS 1742.7.

6.4 Facilities for bicycles

Facilities for bicycles shall comply with the requirements of AS 1742.7 and the Austroads publication “Guide to Road Design Part 6A: Paths for Walking and Cycling”.

The design shall include clear path width, hazard tactile warning devices, cycle hazard warning signs and bollards.

6.5 Service crossings (road)

The minimum width of road surface for service level crossings shall be 3m.

Approved configurations, in addition to the configurations in Section 6.2.1, are:

- ballast

The minimum requirement is a formed ballast crossing level with the rail surface and plane between the two rails. For multiple tracks, the Level Crossing surface shall be plane between each adjacent pair of rails.

Where road base containing any material that may contaminate the ballast is used it shall be separated from the ballast by a suitable geotextile.

All steel surfaces e.g. rail and fastenings in contact with the road material shall be sprayed with bitumen emulsion.

The surface runoff shall be directed away from the track structure.

The approach road construction shall not interfere with the track and cess drainage.

6.6 Service crossings (pedestrian)

The minimum width of crossing surface shall be 1200 mm.

The walkway surface shall be slip resistant.

Hazard tactile warning strips are not required.

Approved configurations, in addition to the configurations in Section 6.3.5, are:

- timber
- fibre reinforced plastic (FRP) grating

6.7 Prohibited configurations

The following configurations are not approved for use in track circuited areas of the CRN network because of the potential for shorting track circuits:

- steel level crossings
- level crossing panels with steel edges that extend fully around the panel.

6.8 Track requirements

6.8.1 General

The track through the level crossing shall comply with the following requirements:

- formation and capping layer in accordance with CRN Engineering Standard CRN CS 410 “Formation & Earthworks”
- concrete or steel sleepers through public road level crossings
- rail ground to the required profile if new rail is used
- new rails if existing running rail is worn, including head width wear and head depth wear
- minimum shoulder ballast width of 75 mm
- ballast to be compacted/stabilised.

6.8.2 Track drainage

Level crossing designs shall provide for track drainage through the level crossing structure.

The drainage design shall be in accordance with CRN Engineering Standard CRN CS 420 “Track Drainage”.

The minimum requirement is a slotted pipe located on the top of the capping layer near the toe of the ballast.

7 Traffic control treatments

7.1 General

There are two types of level crossing traffic control: For each type, there are a number of approved configurations

- Passive control
  - Open level crossings with “Give Way” signs
  - Open level crossings with “Stop” signs
- Active control.
  - Level crossings protected by flashing lights
  - Level crossings protected by flashing lights and boom barriers

These are defined more precisely in AS 1742.7.

Each configuration has an inherent level of safety associated with it. The configuration adopted for any particular site is determined by the level of risk to be managed.

The type of control and control configuration is based on:

- road/rail/pedestrian traffic volumes
- road speed
- train speed
- sight distance to train
- road and rail track alignment
- roadside activity
- accident history
- number of rail tracks.

Passive control configurations are determined in accordance with this Standard.

Active control configurations are determined in accordance with CRN Engineering Standard CRN SD 018 “Signal Design Principles – Level Crossings”.

7.2 Sight distance assessment

Passive control for new or upgraded road crossings shall only be used where sight distances and sight angles as determined in accordance with AS 1742.7 are available.

If sufficient sight distance is not available to meet the sight distance and sighting angle criteria for passive control in AS 1742.7, active control shall be installed at the level crossing.

Sighting distances at all level crossings on operational lines shall be assessed at the frequencies documented in CRN Engineering Standard CRN CS 100 “Civil Technical Maintenance Plan, using the methodology detailed in CRN Engineering Manual CRN CM 521 “Level Crossing Manual”. CRN CM 521 contains additional sighting distance tables not included in AS 1742.7.

For existing level crossings, if sufficient sight distance is not available to meet the sight distance and sighting angle criteria for passive control, the Civil Maintenance Engineer shall implement appropriate risk mitigation actions. Risk strategies include:

- undertake any necessary works to improve sight distance (e.g. removal of obstructions)
- relocate the level crossing to improve sight distances
- impose a speed restriction
- install active control
- close and remove the level crossing.

7.3 Control devices

7.3.1 Passive control signage

Passive control signage at level crossings on the CRN network shall comply with the requirements AS 1742.7.

7.3.2 Sign details

Sign size shall be in accordance with AS 1742.7.

Sign location, height and orientation shall be in accordance with AS 1742.7.

Signs shall be illuminated or reflectorised in accordance with AS 1742.7.

Signs shall be manufactured in accordance with the requirements of AS 1743.

7.3.3 Authorised vehicles only signs

“Authorised Vehicles Only” signs and “Service Road Level Crossing” signs for service level crossings shall be manufactured in accordance with CRN Engineering Specification CRN CP 213 “Trackside Signs”.

7.3.4 Active control devices

Flashing lights, alarms, boom barriers, red man lights, swing gates and associated signage shall be designed and installed in accordance with AS 1742.7, CRN SD 018 and CRN Engineering Specification CRN SC 017 “Level Crossing Equipment”.

7.3.5 Pedestrian enclosures

Pedestrian maze size and location requirements should be in accordance with AS 1742.7, except that the closest point of the maze shall be a minimum 2500 mm from the near rail.

Note: AS1742.7 has been designed to for a motorised scooter 800m wide and 1300m long to navigate in a single forward manoeuvre. Where larger mobility scooters are identified to utilise a level crossing, the pedestrian maze size should be reviewed accordingly.

7.3.6 Other

Pavement markings, width markers, tactile warning tiles and other devices shall be provided in accordance with AS 1742.7.

8 Standard control configurations

8.1 General

Level crossing control configurations shall comply with AS 1742.7 and this Standard.

8.2 Road crossings (public and private)

8.2.1 Passive control

The minimum treatment is the railway crossing give way assembly. This treatment only applies to single tracks and in situations complying with the limits on use in Clause 4.2.2 of AS 1742.7.

The standard treatments are the:

- railway crossing give way assembly and advance warning signs and assemblies.
- railway crossing stop assembly and advance warning signs and assemblies.

Signs and assemblies are detailed in AS 1742.7.

8.2.2 Active control

Active control shall be provided in accordance with AS 1742.7 and CRN Signalling Engineering Standards.

8.3 Pedestrian crossings

8.3.1 Passive control

The minimum treatment at public pedestrian crossings is the railway crossing sign. It shall be used only where pedestrian movement is light

Where pedestrian traffic is heavy a pedestrian enclosure shall also be installed

The controls shall be provided in accordance with AS 1742.7

8.3.2 Active control

On main lines a risk assessment shall determine if active control is required.

Active control devices shall be in accordance with CRN Signalling Engineering Standards.

8.4 Service crossings

8.4.1 Road crossings

8.4.1.1 Passive Control

The minimum treatment at service crossings is the Service Road Level Crossing” sign, as shown in Figure 1, from CRN CP 213

Figure 1 - Service road level crossing sign

8.4.1.2 Active Control

For service road level crossings on main lines a risk assessment shall determine if active control is required.

Active control devices shall be in accordance with CRN Signalling Engineering Standards

8.4.2 Pedestrian crossings

For service pedestrian crossings on main lines a risk assessment shall determine if active control is required.

Active control devices shall be in accordance with CRN Signalling Engineering Standards.

In yards and sidings, the minimum treatment for pedestrian crossings is the look for trains sign as detailed in AS 1742.7.

9 Installation requirements

9.1 General

The level crossing structure shall be installed in accordance with relevant standards and, where proprietary products are used, manufacturers' specifications.

Control devices and associated equipment shall be installed in accordance with AS 1742.7 and relevant CRN Engineering standards and specifications.

The track shall comply with relevant CRN Engineering standards and specifications and any specific requirements in this document.

9.2 Particular requirements – Steel panels

At locations where steel level crossing panels are planned for installation over steel sleepers the following installation requirements shall apply:

- Steel sleepers in level crossings shall only be used where surrounding sleepers are steel.
- The bottom ballast layer shall meet design requirements for the line with regard to grading and depth.
- The bottom ballast layer shall be compacted by roller.

- After tamping all steel sleeper pods shall be inspected at inspection holes to ensure pods are full (ballast to top of pod).
- Steel level crossing panels shall be removed every six years to examine condition of steel sleepers.

9.3 Particular requirements – Flangeway seals

At locations where flangeway seals are planned for installation the following installation requirements shall apply:

- No rail joints are permitted within the level crossing or 10m adjacent.
- Rail shall be full profile (full width and height 53kg or 60kg).
- Concrete sleepers with e-clips shall be used.
- The road surface shall be concrete or asphaltic concrete.

9.4 Particular requirements – cast in situ concrete

At locations where cast in-situ concrete is planned to be installed, the following requirements will apply

- Concrete sleepers shall be installed throughout the level crossing and transition
- To minimise settlement the bottom ballast layer shall be compacted by roller and finished to the within 20mm of the correct height.
- Consideration shall be given to the use of Enhanced Ballast Grading as per CRN CS 240 to increase track stiffness and minimise track deflection
- Care must be taken to ensure there is sufficient curing time for the concrete before road and rail traffic is allowed, if insufficient time is available, cast in-situ concrete is not a viable option.

9.5 Particular requirements – asphalt

At locations where cast asphalt is planned to be installed, the following requirements will apply

- To minimise settlement the bottom ballast layer shall be compacted by roller and finished to the within 20mm of the correct height.
- Consideration shall be given to the use of Enhanced Ballast Grading as per CRN CS 240 to increase track stiffness and minimise track deflection
- Care must be taken to ensure there is sufficient time for the asphalt to fully harden before road and rail traffic is allowed, if insufficient time is available, asphalt is not a viable option.

10 Documentation requirements

Documentation shall be provided as part of the design and installation process.

Drawings shall include details of:

- design parameters (e.g. road and rail approach speeds, road grades, road vehicle class)
- site survey and plan
- design loads for the level crossing structure
- track and road/footpath alignments and levels
- level crossing track and flangeway configuration
- drainage requirements
- locations of insulated joints (where signalling is affected)
- level crossing structure configuration details

- skid resistance/slip resistance details
- control devices
- signage details and specifications
- actual and design sight distances for passive control crossings
- fencing and cattle stops
- physical barriers (where required) for service level crossings.

11 Type approval requirements

The following information shall be submitted when requesting type approval of a level crossing product design:

- Design calculations
- Drawings
- Compatible rail types and sizes
- Test results for skid/slip resistance
- Assembly and installation procedures
- Spares list and availability
- Maintenance plan including details of failure modes, inspections and procedures manual.

12 Acceptance standards

12.1 Construction

This section specifies the requirements for acceptance of new construction and renewal of level crossings.

12.1.1 Track

The track shall comply with the acceptance standards in CRN Engineering Standard CRN CS 210 “Track Geometry and Stability”.

12.1.2 Level crossing structure

The crossing width shall comply with the approved design.

The level crossing structure shall be installed in accordance with the design and good engineering practice.

The surface shall be in good condition with no potential to cause hazard to users.

Modular crossing installations shall comply with manufacturers’ instructions. Panels shall be fully restrained. There shall be no gaps between adjacent panels.

The footpath grade shall comply with the approved design.

Guard rails, fences, pavement markings, track drainage and signage shall comply with the approved design.

The level crossing structure installation shall com ply with the acceptance limits in Table 1:

Parameter	Standard	Variation from standard
Road Crossings		
Surface level relative to top of rail	Level	+5 mm to -5 mm
Flangeway gap	60 mm min	-0 mm to +5 mm

Pedestrian Crossings		
Surface level relative to top of rail	Level	+5 mm to -5 mm
Flangeway gap	60 mm	-0 mm to +5 mm
Flangeway depth	50 mm	+0 mm to -5 mm
Service Crossings		
Surface level relative to top of rail	Level	+5 mm to -5 mm
Flangeway gap	60 mm min	-0 mm to +5 mm

Table 1 – Construction Acceptance Limits

12.2 Maintenance

This section specifies the requirements for acceptance of level crossings at the completion of track maintenance activities.

12.2.1 Track

The track shall comply with the acceptance standards in CRN CS 210.

12.2.2 Level crossing structure

The level crossing structure shall comply with the acceptance limits in Table 2 on completion of maintenance work:

Parameter	Standard	Variation from standard
Road Crossings		
Surface level relative to top of rail	Level	+10 mm to -10 mm
Flangeway gap	60 mm min	-0 mm to +10 mm
Pedestrian Crossings		
Surface level relative to top of rail	Level	+5 mm to -5 mm
Flangeway gap	60 mm	-0 mm to +5 mm
Flangeway depth	50 mm	+0 mm to -5 mm
Service Crossings		
Surface level relative to top of rail	Level	+10 mm to -10 mm
Flangeway gap	60 mm min	-0 mm to +10 mm

Table 2 – Maintenance Acceptance Limits

Appendix 1 Approved level crossing products

Product approvals are dependent on both the manufacturer and supplier. If either changes, the product approval may no longer be valid. Seek advice from the Principal Track and Civil Engineer.

Product Approval Numbers are shown for all products approved by UGLRL CRN. Other products listed were approved for use on CRN prior to January 2012 and have been accepted by UGLRL CRN.

Level Crossing Products				
Product Approval No.	**Common Item Name**	**Description**	**Standard/ Drawing**	**Manufacturer/ Supplier**
N/A	Level Crossing Guard Rail	Steel Guard Rail for level crossings		N/A
N/A	BODAN level crossing system	Frameless Polymer Concrete Panel		Bodan / KH1 Pty Ltd
N/A	STRAIL Rubber level crossing	Rubber Panels[1]		STRAIL / Pheonix AG (Australia) Pty Ltd
CRN C020	Flangeway seal	Polycorp EPFLEX Railseal for 53kg rail concrete sleepers, E-clip fastenings	Polycorp RA-4053-1E UGLRL Drawing CC000299	Polycorp/ Waranga Solutions
CRN C020	Flangeway seal	Polycorp EPFLEX Railseal for 60kg rail concrete sleepers, E-clip fastenings	Polycorp RA-4060-06J UGLRL Drawing CC000300	Polycorp/ Waranga Solutions
Pending	edilon)(sedra LCS	edilon)(sedra LCS (Level Crossing System) for 53kg rail		edilon)(sedra
Pending	edilon)(sedra LCS	edilon)(sedra LCS (Level Crossing System) for 60kg rail		edilon)(sedra

Note 1 Variants on the design have non-conforming flangeway widths. When ordering need to confirm that the compliant flangeway width is ordered

Appendix 2 Appendix 2 Recommended minimum level crossing solutions

Recommended minimum level crossing solutions are yet to be determined