

# Engineering Services Standard

# Level Crossing Management

## Purpose

This document outlines the requirements for the management of level crossings within KiwiRail.

## Document Control

<b>Document No.</b>	G-ST-LC-9120	<b>Issue No.</b>	Issue 1.1
<b>Date Effective</b>	1/06/2017	<b>Author</b>	John Skilton
<b>Prepared (P) Reviewed (R) Amended (A)</b>	(A) Mark Fleet	<b>Checked and Approved By</b>	Engineering Services Interface – Technical Committee
		<b>Authorised for Release By</b>	General Manager – Engineering Services

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## 1. Revision Procedure and History

This is a 'living' document, that will be up dated every five years or whenever KiwiRail determines that changes to it and processing requirements documented herein are appropriate.

If changes arise from the review this document will be reissued, however, if no changes arise from the review, the current version of this document will remain in force.

Refer to the **Briefing Note(s) for G-ST-LC-9120 Level Crossing Management** (at the end of this document) for full document changes.

Issue No	Prepared (P) Reviewed (R) Amended (A)	Authorised for Release By	Date Effective
1.1	(A) Mark Fleet		

### 1.1 Changes in this issue

Issue No	Description	Page(s)
1.1	Corrections to list of Associated Documents	
	Additions to Acronyms and Definitions	

### 1.2 Withdrawn, closed and superseded

Old Reference	Title	Replaced by
CSG417 / Q417	Level Crossings	G-ST-LC-9120

## 2. Associated Documents

Level	Number	Title
	KAI-AMP056-REF02	<a href="#">New Rail Crossings – Guidance for Applicants</a>
	KAI-AMP056-REF01	<a href="#">New Rail Crossings – Management Guidance</a>
	NZTA Part 9	<a href="#">NZ Traffic Agency Transport Control Devices (TCD) Manual Part 9</a>
3	T-ST-AM-5360	Track Standard – <a href="#">Level Crossings</a>
4	CSG111	<a href="#">Q461 Work on or near Public Roads</a>
4	CSG107	<a href="#">Electrification Safety Signs and Posters</a>
	RTS 14	Guidelines for Facilities for the Blind and Impaired Pedestrians
2	S-PR-LC-2015	Signals and Telecommunications Principles – <a href="#">Level Crossings</a>
3	S-ST-LC-2119	Signals and Telecommunications Standard – <a href="#">Level Crossings</a>
	AS7658	Level Crossings
		Rail Crossing risk Assessment and Cycle / Pedestrian Design Guidance

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### 3. Acronyms and Definitions

Acronyms	Definition
ALCAM	Australian Level Crossing Assessment Model
AMEI	Asset Management Engineering Infrastructure
AUP	Alarm Upgrading Program
IRIS	Incident Reporting and Investigation System
LCIP	Low Cost Improvement Program
LCSIA	Level Crossing Safety Impact Assessment
LCSS	Level Crossing Safety Score
NZTA	New Zealand Transport Authority
PH	Professional Head
PMO	Project Management Office
RCA	Road Controlling Authority
RMA	Resource Management Act 1991
TCD	Transport Control Devices

## 4. Scope

This document outlines the KiwiRail requirements for the management of level crossings on the KiwiRail network. These requirements do not supersede legal requirements or special binding agreements that are already in existence.

### 4.1 Use in the field

This document has been designed to be used in the field. It is expected that this document will be opened in an iPad via 'Briefcase' and used as reference to complete the task. Note as written on the front cover the controlled version is held on iKon. **Printed copies of this document are uncontrolled.**

## 5. Types of Level Crossing

### 5.1 Private level crossings

#### 5.1.1 Statutory

Statutory crossings were provided for by statute at the time the railway was constructed and physical access to severed portions of private land was required where no other legal access existed.

These are private crossings that have generally been provided subsequent to a railway's opening or when no statutory obligation exists and for which Deeds of Grant set out the conditions on which each is provided and maintained.

In some circumstances a statutory private level crossing can alter in status to a Granted crossing and be subject to a Deed of Grant.

The existence of a Granted crossing is also dependant on the legal framework that existed at the time of construction as there are periods of time where no statutory obligations exist.

#### 5.1.2 Not statutory or granted<sup>1</sup>

These are not legal until formally documented by KiwiRail Corporate Property.

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<sup>1</sup> There are also known to be private crossings of both the statutory and granted types that are used by unauthorised parties. These situations should be brought to the attention of Corporate Property for resolution. Rights can only be granted by KiwiRail in accordance with Section 35 of the NZRC act 1981.

### 5.1.3 Temporary private level crossings

KiwiRail may grant temporary private level crossings (often limited to two (2) years) for logging or construction work access, provided design requirements are met. If a new or temporary level crossing is approved, a Deed of Grant is required before the level crossing becomes operational.

## 5.2 Public Level Crossings

### 5.2.1 Granted

All Public Level Crossings are provided in compliance with the:

- Public Works Act 1981, Section 166; and
- New Zealand Railways Corporation Act 1981, Section 35; road vs rail land difference

Granted Public Level Crossings can be level crossings on a legal road or on operational railway land. All these level crossings shall be subject to a Deed of Grant that sets out the conditions on which each is provided and maintained..

Deed of Grant with Road Controlling Authorities are to be entered into wherever possible, covering all public level crossings (except on State Highways) within an authority's boundary, whether the crossings are sealed or unsealed.

A statutory crossing will still be documented by way of a 'no cost' Deed of Grant, this is required to ensure ownership and ongoing maintenance obligations are tracked by KiwiRail.

Minimum standards **must be** met at all times before a new crossing is approved. Where standards **cannot be met**, then an independent and comprehensive risk assessment must be conducted. All risk assessments shall be documented and written approval needs to be given by the Network Services Manager before a new Deed of Grant can be issued. The ALCAM model shall be used as part of the risk assessment process.

### 5.2.2 Not granted

These are not legal until formally documented by Group Property.

A substantial number of level crossings in this category have no Deeds of Grant whilst there are others where there is no record held by KiwiRail of a Deed of Grant agreement in force.

## 6. Private Level Crossing Classification

There are three classes of private level crossings as defined in Table 6.1.

Level crossings with the potential to be used by longer vehicles or the general public must be assessed against the appropriate higher class. Likewise, where a level crossing has multiple uses it must always be assessed against the higher class (ie a level crossing which has both commercial and residential use is considered as a Class A crossing).

The class of crossing determines the:

- Maximum length of vehicle allowed over the level crossing (Table 6.1);
- Minimum required view lines (Table 6.2);
- Minimum required stacking distance (Table 6.3); and
- Signs and road marking requirements (Table 6.4).

**Table 6.1 Determining the class of a level crossing**

Class	Vehicle Length Restriction <sup>2</sup>	Use		Public Access
A	25m	Commercial	Access to a commercial or industrial premise. Includes forestry, factories, milking sheds, quarries. Use by truck and trailer units.	The general public are likely to access the crossing
		Retail	Access to a retail business, accommodation, shops or tourist activities.	
		Public facilities	Access to parks, rivers beaches, picnic spots or the use of the crossing as a thoroughfare.	
B	15m	Residential	Access to fewer than three houses.	The general public may access the crossing
		Primary farm	Access to main farming sheds or multiple paddocks. Typically an unmade or gravel road.	
C	10m	Secondary farm	Access to paddocks or stock crossings. Typically an unmade or gravel road.	The general public are unable to access the crossing
		Rail or utilities	Service access only	

The tables below define the minimum view line, stacking distance and signage requirements for private level crossings.

<sup>2</sup> The 25 m, 15 m and 10 m demarcation limits are based around the NZ Transport Agency maximum vehicle length and 99% vehicles:

- 25 m allows use by a maximum length vehicle on New Zealand roads.
- 15 m allows use by a rigid truck (12.6 m) bus (12 m) or car and trailer (13.7 m).
- 10 m allows use by a rigid vehicle (9.5 m), tractor or quad bike.

Table 6.2 Minimum view lines for private level crossings (m)

Gradient		Class A			Class B			Class C		
		0%	0 – 6%	>6%	0%	0 – 6%	>6%	0%	0 – 6%	>6%
Train Speed (km/h)	25	105	140	168	89	112	140	79	100	124
	40	167	224	268	142	180	224	126	160	198
	50	209	280	335	177	225	280	158	200	248
	60	251	337	402	121	270	336	190	240	298
	70	293	393	469	248	315	393	221	280	347
	80	335	449	536	283	30	449	253	320	397
	90	377	505	603	319	405	505	284	360	447
	100	419	561	670	354	450	561	316	399	496
	110	461	617	737	390	495	617	347	43	546

Table 6.3 Minimum stacking distance for private level crossings

	Class A	Class B	Class C
Minimum safe-stacking distance	30 m	20 m	15 m

Table 6.4 Sign and road marking requirements for private level crossings

Class A	Class B	Class C
<ul style="list-style-type: none"> <li>Public level crossing standard</li> <li>Location sign</li> </ul>	<ul style="list-style-type: none"> <li>Restricted 15 m length sign</li> <li>Private stop sign</li> <li>Private crossbuck sign</li> <li>Mounted on white pole</li> <li>No road marking required</li> <li>Location sign</li> </ul>	<ul style="list-style-type: none"> <li>Restricted 10 m length sign</li> <li>Private stop sign</li> <li>Private crossbuck sign</li> <li>Mounted on adjacent structure</li> <li>No road marking required</li> <li>Location sign</li> </ul>

## 6.1 Classification and assessment of existing private level crossings

Classification of existing private level crossings should be undertaken by KiwiRail Asset Engineers under the direction of the Network Services Managers.

All existing level crossings shall comply with this Standard and NZTA TCD part 9 when:

- a Deed of Grant is being issued
- entering into negotiations with landowners
- major work is being carried out on or around the level crossing
- a low cost improvement has been carried out
- a level crossing is deemed to be high-risk
- an ALCAM risk assessment of the crossing has been requested or
- there has been a collision.

Where standards cannot be met and the crossing is deemed High Risk via an ALCAM assessment, then the crossing should be closed or upgraded to meet an acceptable level of risk. All risk assessments shall be documented and written approval needs to be given by the Network Services Manager before a new Deed of Grant can be issued. The ALCAM model shall form part of the risk assessment process.

## 6.2 Re-classifying a level crossing

Where:

- a landowner requires access by longer vehicles, then the crossing shall be reassessed against the requirements for a higher standard.
- it meets these standards then the level crossing can be formally re-classified and the vehicle length restriction can be raised or removed.

## 7. Minimum Criteria for New Crossings

Level crossings are acknowledged internationally as introducing safety risk into the rail and road / pathway networks. KiwiRail will endeavour to reduce the number of level crossings through closure and grade separation and only in exceptional circumstances will permit new level crossings to be introduced onto the network, and only when the project includes closure of one or more existing level crossings.

The application for and management of new level crossings is detailed in the New Rail Crossings documents:

- Guidance for Applicants KAI-AMP056-REF02
- Management Guidance KAI-AMP056-REF01

Where a new level crossing proposal has met KiwiRail’s above policy and has been approved by KiwiRail to be built then the minimum criteria outlined in the tables below must be achieved.

All level crossing surfacing is to comply with Standard Drawings CE 300182.

**Table 7.1 Public road level crossings**

		Minimum Criteria
Proposal Stage	1	<p>The applicant <b>must be</b> the local RCA:</p> <ul style="list-style-type: none"> <li>• The nearest adjacent public level crossing shall be 1 km in urban areas and 2 km in rural areas.</li> <li>• Where reasonable alternative access:                             <ul style="list-style-type: none"> <li>○ <b>exists</b> or can be readily provided the estimated annual vehicle kilometres saved shall exceed 50,000.</li> <li>○ <b>does not exist</b>, the crossing shall provide access to a minimum of 50 ha of industrial or 1000 ha of rural land.</li> </ul> </li> </ul>
	2	<ul style="list-style-type: none"> <li>• The viewline requirements of NZTA TCD Part 9 shall be met.</li> <li>• Where possible all level crossings should cross the tracks at a 90° skew.</li> <li>• Sites:                             <ul style="list-style-type: none"> <li>○ <b>where</b> 70o – 90o skew can be achieved require a site specific risk analysis</li> <li>○ <b>with</b> &lt;70 o require approval from the Professional Head (PH) Track Engineering</li> </ul> </li> <li>• Approaches should have at least 30 m of straight road on either side of the crossing, and desirably 105 m.</li> <li>• Approach gradients should rise slightly:                             <ul style="list-style-type: none"> <li>○ Maximum grade for approach is to be 1:14. All grades to fall away from the track centreline. .</li> <li>○ .</li> </ul> </li> <li>• The formation is to be graded at a minimum of 1:33 (3%) laterally across the track.</li> <li>• ALCAM survey assessment undertaken to identify site-specific safety risks.</li> <li>• Risk mitigations applied to ensure that an ALCAM ‘Low’ risk rating is attained.</li> <li>• Crossings over railway yards or crossing loops shall not be permitted under any circumstances.</li> </ul>

**Table 7.2 Public pedestrian level crossings**

		Minimum Criteria
Proposal Stage	1	<ul style="list-style-type: none"> <li>The applicant <b>must be</b> the local RCA.</li> <li>A case of changed circumstances can be quantified (eg access to new facilities).</li> <li>A minimum distance of 100 metres from any reasonable alternative access route.</li> <li>Estimated annual pedestrian kilometres saved to exceed 500.</li> <li>All alternative possibilities of a bridge, underpass or other crossing have been considered.</li> </ul>
	2	<ul style="list-style-type: none"> <li>The viewline requirements of NZTA TCD Part 9 shall be met.</li> <li>The crossing should be at 90° to the track.</li> <li>Protection items described in section 7.2 of this document should be provided at applicants cost.</li> <li>Crossings over railway yards or crossing loops shall not be permitted.</li> <li>ALCAM survey assessment undertaken to identify site-specific safety risks.</li> <li>Risk mitigations applied to ensure that an ALCAM 'Low' risk rating is attained.</li> <li>Crossings over railway yards or crossing loops shall not be permitted under any circumstances.</li> </ul>

**Table 7.3 Private road level crossings (commercial)**

		Minimum Criteria
<b>Proposal Stage</b>	1	<ul style="list-style-type: none"> <li>• Applicant must be a substantial business.</li> <li>• No reasonable alternative access is available.</li> <li>• Any commercial disadvantage to KiwiRail should be considered.</li> </ul>
	2	<ul style="list-style-type: none"> <li>• The viewline requirements of NZTA TCD Part 9 shall be met.</li> <li>• Where forklifts or other plant are expected to cross, minimum warning time at 5 m from track centre should be the greater of 20.6 seconds or maximum time for machine to cross plus 3 seconds.</li> <li>• Approach grades should not exceed 1% where forklifts or other machines run or 3% where road vehicles only run.</li> <li>• Approach gradients should rise slightly.</li> <li>• Maximum grade for approach is to be 1:14. All grades to fall away from tracks.</li> <li>• The formation is to be graded at a minimum of 1:33 (3%) laterally across the track.</li> <li>• ALCAM survey assessment undertaken to identify site-specific safety risks.</li> <li>• Active warning control devices should be provided at the applicant's cost where:                             <ul style="list-style-type: none"> <li>○ ALCAM modelling justifies the use of active controls</li> <li>○ more than one running track is crossed or</li> <li>○ standing wagons may obstruct views.</li> </ul> </li> <li>• Consideration to be given to providing a locked gate on the road side of the crossing where access is to a public road.</li> </ul>

Table 7.4 Private road level crossings (non-commercial)

		Minimum Criteria
Proposal Stage	1	<ul style="list-style-type: none"> <li>• Access is to a farm, private residence or to service an installation (eg pole line, gas line valve, transformer, substation etc.) to which there is no reasonable alternative access.</li> <li>• No alternative public road or public level crossing within 1 km.</li> <li>• No private level crossing held by the applicant, within 2 km giving access to the same land.</li> </ul>
	2	<ul style="list-style-type: none"> <li>• The viewline requirements of NZTA TCD Part 9 shall be met</li> <li>• Crossings should have either: <ul style="list-style-type: none"> <li>○ cattle-stop to Class 1 Highway loading standard on both sides</li> <li>○ a cattle-stop on one side and a gate at least 25 m from track centre line on the other</li> <li>○ a gate at 4 m from track centre line on one side and a gate at least 25 m from track centre line on the other or</li> <li>○ all gates to swing open away from the track.</li> </ul> </li> </ul>

## 8. Level Crossing Data

### 8.1 Maximo

Maximo is KiwiRail's asset management system. Maximo is the single source of information for the existence, location, legality, access, use, type, physical assets at, installation, inspection and maintenance regime of a level crossing on the KiwiRail network.

### 8.2 ALCAM

The Australian Level Crossing Assessment Model (ALCAM) is the system by which risk at level crossings is determined and ranked in New Zealand. Refer to NZTA TCD Part 9 – Appendix D which provides an overview of ALCAM and the processes behind it.

Fundamental to ALCAM is accurate and current information relating to the physical characteristics of a level crossing, vehicle and / or pedestrian counts and train frequency.

Full ALCAM surveys can only be carried out by suitably trained personnel. Update information can be entered into the ALCAM database by anyone granted the permission to do so. It is the expectation that ALCAM:

- rail related data (eg protection type, train density) will be maintained by KiwiRail
- road related data (eg approach signage, vehicle counts) will be maintained by RCA's.

ALCAM provides a risk score for every level crossing. This score, while a significant factor, must be considered along with:

- local knowledge
- collision and near miss history
- engineering knowledge
- standards and guidelines and
- cost / benefit when considering appropriate risk mitigation measures.

On completion of any works, an ALCAM re-survey shall be undertaken and new data shall be entered into the ALCAM database by the Regional Managers delegated person.

For the avoidance of doubt ALCAM is not an asset condition or works management tool, this information is managed through Maximo.

ALCAM surveys or re-surveys shall be undertaken at road and pedestrian crossings:

- when applying for a new crossing
- on completion of new works, remedial works and upgrades
- whenever any significant change has occurred to the road or pedestrian crossing
- after any collision if the current ALCAM assessment does not accurately represent the crossing.

### **8.3 Vision**

Qube Vision is a suite of comprehensive integrated corporate real estate and commercial property management software modules used by KiwiRail property to manage the owned and leased portfolios more effectively, with less effort and reduced risk.

Tracking of Deed of Grants and invoicing for Public and Private Rail crossings are managed by KiwiRail property in Vision.

### **8.4 Incident reporting and investigation system (IRIS)**

All reported incidents (actual or near miss) and any investigation recommendations (internal or external) are recorded in IRIS.

Incidents must be recorded in IRIS within 24 hours of occurrence.

## 9. KiwiRail Responsibilities

### 9.1 Corporate and network services group responsibilities

The broad responsibilities for Traction and Electrical, Track, Structures, Civil, and Signals and Telecommunications are outlined in Table 9.1.

**Table 9.1 Network services group responsibilities**

Discipline	Responsibilities
<b>Critical Risk Network</b>	<ul style="list-style-type: none"> <li>• Understanding of overall risk.</li> <li>• Prioritisation of risk mitigations.</li> <li>• Review of incident data and trends to ensure effectiveness of controls.</li> <li>• Oversight of budget, planning and upgrades to deliver risk mitigations.</li> </ul>
<b>Traction and Electrical</b>	<ul style="list-style-type: none"> <li>• Set and maintain traction overhead wire heights.</li> <li>• Supervise high load crossings in electrified areas.</li> <li>• Design Installation and Maintenance of traction bonding to level crossing facilities.</li> </ul>
<b>Signals and Telecommunications</b>	<ul style="list-style-type: none"> <li>• Design, construction, installation, inspection and maintenance of automatic warning devices for road and pedestrian level crossings.</li> <li>• Input into and approval of layouts for new and modified level crossings which include active protection.</li> <li>• Acceptance of active road and pedestrian level crossing alarm equipment into service.</li> <li>• Management of the ALCAM database.</li> <li>• Working with the local RCA in obtaining information on road, rail and pedestrian traffic densities for input into the ALCAM database.</li> <li>• Co-operation with the NZ Transport Agency concerning periodic national surveys of crossings.</li> </ul>
<b>Track</b>	<ul style="list-style-type: none"> <li>• The design and construction of new and/or upgraded public and private road and pedestrian crossing surfacing systems, as detailed in standard drawing CE300182.</li> <li>• The design and construction of new and/or upgraded public and private road and pedestrian crossing drainage systems, as detailed in standard Drawings CE300182 and CE100862.</li> <li>• Input into and approval of layouts for new and modified level crossings.</li> <li>• Acceptance of road and pedestrian level crossings into service.</li> <li>• Inspection, maintenance and installation of road and pedestrian level</li> </ul>

Discipline	Responsibilities
	<p>crossings shall be in accordance with document T-ST-AM-5360 Level Crossing Management including:</p> <ul style="list-style-type: none"> <li>○ Mazes</li> <li>○ Fences</li> <li>○ Gates</li> <li>○ Footpath and road surfaces</li> <li>○ Tactile ground surface indicators</li> <li>○ Road markings</li> <li>○ Crash protection barriers</li> <li>○ All pedestrian signs providing visual protection of the crossings</li> <li>○ Drainage, pipelines or culverts</li> <li>○ Viewlines.</li> </ul> <ul style="list-style-type: none"> <li>● Standards and maintenance of road surface, geometry, lane definition, crossing width, and carriageway separation in conjunction with RCA's as appropriate.</li> <li>● Collection of ALCAM data (survey assessments).</li> <li>● Negotiation with appropriate bodies for recovery of costs of installation and maintenance of road and pedestrian crossings.</li> </ul>

## 9.2 Group property responsibilities

The broad responsibility for Corporate Property is outlined below:

- Preparation of Deeds of Grant and Leases including issues concerning opening, relocating and closing crossings.
- Negotiations with Land Information New Zealand (LINZ) local RCA and other interested parties on land issues including subdivision of adjacent land and any implied or increased or shared use of private level crossings or statutory crossings.

## 9.3 RMA group responsibilities

The broad responsibility for the RMA team within KiwiRail as they relate to level crossings is outlined below. The RMA team work with many of the other teams and disciplines in KiwiRail when undertaking these tasks to ensure that robust and accurate decisions are made.

- Ensuring the rail designation is reviewed as each District Plan is reviewed, and ensuring that level crossings are included within the designation
- Providing feedback and submissions to Territorial Authorities on District Plan provisions in relation to transportation and the rail network, in particular in relation to protecting sightlines at level crossings in accordance with NZTA Part 9, ensuring buildings are setback from boundaries with the rail corridor, and that vehicle accesses are setback from level crossings
- Working with Regional Council's in the development of the Regional Land Transport Strategies to ensure that the rail network is included in the objectives and policies for that region and
- Providing written approval where KiwiRail are an affected party to a resource consent application.

## 9.4 Installation and maintenance responsibilities adjacent to crossings

### 9.4.1 Public level crossings

A table describing the general responsibilities for carrying out physical works are located in the NZTA TCD Part 9 – Appendix E. This does not reflect the responsibility for funding the work. Funding arrangements **must be** agreed in writing between KiwiRail and the RCA.

The NZTA TCD Part 9 – Appendix E, should only be used as a guide. There may also be formal maintenance agreements, Deed of Grants or legal Interpretations applying to a specific location, or asset that differ from the table.

Installation and maintenance on many of the assets require cooperation between KiwiRail and the RCA. Significant risk reductions and cost savings can be reached through coordinating these upgrade or maintenance activities.

### 9.4.2 Private level crossings

The responsibilities for private level crossings are specified in individual Deed of Grants, or in legislation. Clarification of this can be obtained by contacting Group Property.

### 9.4.3 General works

NZTA TCD Part 9 Appendix C outlines the requirements for working on or near level crossings. Critical to this work is the need for close communication between the Rail Access Provider and RCA's and the requirements for Traffic Management Plans.

Anyone who wishes to work in the railway corridor must obtain a permit to enter issued by the rail access provider or railway premises owner.

In electrified areas, the nature of the work to be undertaken may also require an electrical safety permit to work. This permit will generally be required when working within 4 m of overhead traction wires (train power supply lines).

Both these permits are subject to a fee and, depending on the nature of the work, may require the rail access provider or railway premises owner to provide a protection employee at the working party's cost.

More information on the permits required to work on or near the rail corridor is provided on the KiwiRail website at <http://www.kiwirail.co.nz/in-the-community/accessing-the-corridor>.

## 10. Traffic Signs

### 10.1 Public level crossings

NZTA TCD Part 9 provides guidance on:

- The use and placement of approved signs.
- The responsibilities between KiwiRail and the RCA in relation to the installation of signs.
- Legal requirements regarding specific road vehicles.

The Land Transport Rule: Traffic Control Devices 2004 (Rule 54002) provides guidance on:

- Traffic control devices at level crossings).
- Defines responsibilities of RCA and the access provider.

Additional Signs in electrified areas are the responsibility of the local RCA (except for private level crossings) and should be provided as detailed in the NZTA TCD Part 9.

Stop and Give Way signs on public roads should not be removed or erected without first consulting the local RCA.

## 10.2 Private level crossings

### 10.2.1 Signage

The signs installed at non-gated approaches to private level crossings are a:

- 1) cross buck for private level crossings (WX62 or WX63) – Minimum Requirement
- 2) private level crossing Stop (RPX4) or private level crossing Give Way (RPX5) assembly as appropriate or
- 3) standard level crossing Stop (RPX2) or standard level crossing Give Way (RPX3).

If the general public are invited to use a private level crossing (eg to gain access to an advertised business or where the original single ownership use has intensified through change of land use), the signs for public roads (RPX2 or RPX3) will apply. In addition signage identifying the location of the crossing, emergency response details and any vehicle length restrictions as shown in Figure 10.1 and Figure 10.2 is required.



Figure 10.1 Private level crossing location



Figure 10.2 Private level crossing location with vehicle restriction

## 10.2.2 Where a deed of grant exists

The rail access provider is responsible for providing Grantees with appropriate signs at private level crossings. The Deed of Grant for the level crossing will define responsibility (including cost) for sign installation and maintenance.

## 10.2.3 Where no deed of grant exists

Where no grant exists the Access Provider will provide appropriate signage as required to meet minimum safety standards – cost may be recoverable under legislation if it is not a Statutory Crossing.

# 11. ViewLines

## 11.1 Approach visibility

A road vehicle driver approaching a level crossing with a Give Way (RPX3) sign needs to be able to either:

- see an oncoming train in time to stop before reaching the level crossing or
- continue at the approach speed and cross the level crossing safely ahead of a previously unseen train or a train far enough away to be clearly not a collision threat.

The required sight triangles to achieve this are calculated as stated in NZTA TCD Part 9 – Appendix B.

## 11.2 Restart view

A road vehicle driver when stopped at the stop line needs to be able to see far enough along the railway to be able to start off, cross and clear the level crossing safely before the arrival of any previously unseen train. The required sight triangles to achieve this are calculated as stated in NZTA TCD Part 9 – Appendix B.

## 11.3 Sighting angles

In order to ensure a motor vehicle driver can see along the prescribed sight triangles without excessive head movement or sight obstruction by parts of the vehicle itself, the maximum sighting angles used are shown in NZTA TCD Part 9 – Appendix B.

## 11.4 Pedestrian sight distances

At a level crossing where there is no active control for either roadway or pedestrian traffic, for a train approaching from either direction, the sight distance (SD) in metres to oncoming trains to enable pedestrians to cross safely is stated in NZTA TCD Part 9 – Appendix B.

## 12. Level Crossing Associated Infrastructure

### 12.1 Guard rails

Provide only when the RCA specifically requests that they be installed and agrees to pay the costs of installation and maintenance.

### 12.2 Gates and cattle stops

Gates and cattle stops shall be retained or provided only where risk of stock wandering is high as determined by the Regional Infrastructure Manager.

### 12.3 Side fences

These help to define the crossing, both to motorists and locomotive engineers. Side fences are now only provided to identify crossings where the road edge is not readily definable to provide the appropriate visual impact.

These will normally be on non-sealed roads in rural areas or where it is necessary to maintain cattle-stops.

Side fences should be painted white and may be up to three metres from track centreline. New or replacement fences should be timber, not 'old rail' construction, to avoid 'impaling' accidents.

Reference in regards with fencing installation and maintenance responsibilities can be found in the NZTA TCD Part 9 – Appendix E.

### 12.4 Poles

New or replacement poles used for mounting signals, barrier arms and signs should be sited as far as possible on the left-hand side of the approach road, from the crossing as circumstances will allow, to avoid affecting view lines.

## 13. Road Geometry, Surfacing and Lighting

Grades up to level crossings should be near level for sufficient distance each side of the track to ensure minimum restart times for road vehicles stopping at the crossing. They should preferably give a slight rise to the track so that vehicles will not run down onto the track and also to provide good drainage away from the track.

Approaches where there is sag at the track are not desirable and should be improved whenever possible. A pronounced hump at a level crossing is not permitted as long wheel-base road vehicles such as low slung transporters have insufficient clearance to negotiate them.

The minimum requirement is a vertical curve or two rising grades with a versine of not more than 350 mm in a 10 m chord evenly spaced on track centre line.

It is important for Asset Engineers to liaise with local RCA's and initiate the necessary improvements to bring existing crossings up to the minimum standards. Where modifications are required these will be the responsibility of the RCA. Refer to NZTA TCD Part 9 – Section 7.0 for standard construction requirements for level crossings,

Note any work (sealing), or changes in conditions at level crossings (reworks, upgrades or sealing within 5 m of any track) **must** comply with all requirements outlined in section 9.4.3.

## 14. Road Marking

As road marking at level crossings is generally outside the rail corridor it will normally be the responsibility of the RCA. Specific exceptions to this apply where the level crossing is:

- a private granted level crossing or a rail operations level crossing where the rail access provider is responsible and
- where crossings are provided in operational areas such as marshalling yards where the rail operator will be responsible.

The RCA **must** liaise with the KiwiRail before installing or altering any new road marking in the vicinity of a level crossing. Road marking contractors **must** ensure all necessary permits to enter have been obtained for any work that encroaches on the rail corridor.

### 14.1 Public level crossings

Refer to NZTA TCD Part 9 – Road marking for more specific requirements and typical situations for road marking around level crossings.

The requirements in the manual cover:

- Centrelines
- No-passing lines
- Flush medians
- Limit lines
- Pavement messages
- No-stopping lines
- Cross hatching (clear zones) and
- Emergency-escape zones.

For general layout of signs and markings for private property access level crossings refer to NZTA TCD Part 9 – Requirements for Private Crossings.

## 15. Level Crossing in Close Proximity to an Intersection

### 15.1 Short stacking

The term 'short stacking' refers to locations where an existing level crossing is in close proximity to an intersection and a vehicle, particularly a maximum-sized heavy motor vehicle (20–25 m long), could block the level crossing or intersection when departing from either. Refer to NZTA TCD Part 9 – Short stacking for list of considerations.

### 15.2 Queues

Where an actively controlled level crossing is regularly encroached by queues of vehicles from a nearby, generally signalised, intersection consideration should be given to:

- Integration of the railway signalling circuits to force phases in the traffic signals.
- Where the level crossing is a distance from the intersection which would not allow queue clearance without excessive advance train detection (and therefore untenable traffic signal phase timings), normal traffic signals at the level crossing with queue detectors on the critical departure side may be provided.<sup>3</sup>
- Emergency-escape zones on the departure side.

Emergency-escape zones are bays installed on the left or right hand side of the road where a vehicle 'caught' in a queue and over the railway lines can, when the flashing lights and bells start operating, move forward into the bay to enable them to clear the railway line.

These bays should be designed in such a way that they will only be used for the purpose intended. This generally means that exiting from the bay does not mean the driver can simply drive forward but is required to filter back into the queue of vehicles in the adjacent lane. To achieve this, the design would normally provide for no more than two cars or a single unit truck and have a physical island with non-mountable kerbing terminating the bay.

## 16. Level Crossing in Close Proximity to a Driveway

Driveways that are close to level crossings can create problems for drivers moving into or out of the driveway across the level crossing and can introduce difficulties for the rail access provider and RCA in relation to the placement and alignment of traffic control devices.

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<sup>3</sup> **Note:** This concept is not permitted under current rules and is being considered for formal trial. See NZTA Part 9, Section 6.4 Traffic signal integration with level crossing.

Drivers turning:

- into the driveway could block, or cause the blockage, of the level crossing.
- out of driveways, particularly heavy truck drivers, may have insufficient room to align their vehicle at the level crossing to enable them to see along the railway lines for any approaching train. Their attempt to gain access to the roadway may distract them from also assessing the presence of a train.

The angle at which drivers are able to enter or leave a driveway may lead (eg to barrier arms being incorrectly aligned to stop them from crossing the railway line or, to avoid this, there may be less than optimum alignment for the main road users). Additional warning signs or flashing light assemblies may be required and/or special segregated access driveways.

It is recommended that driveways should not be located closer than 30 m to a level crossing unless special precautions are taken. Greater distances are desirable where there is likely to be large vehicles regularly entering the site and would be essential where the driveway leads to a significant traffic generator (eg shopping centre, service station).

## 17. Pedestrian Level Crossings

Pedestrian level crossings should be grade separated where ALCAM and / or another risk assessment has determined that it is appropriate to do so. Where a decision is taken to grade separate a road crossing, the adjacent pedestrian crossing must also be grade separated.

Pedestrian crossing design shall consider access for people with disabilities.

Prior to the commencement of all new, remedial or upgrade works an ALCAM assessment shall be used to enable risks to be identified and used to determine if grade separation is required.

The NZTA TCD Part 9 sets out the guidelines for pedestrian level crossings to ensure the various levels for road and rail protection are applied consistently throughout New Zealand. It sets out the design, funding responsibilities, rail and RCA responsibilities and warrants for determining appropriate levels of passive and active crossing protection for road and rail crossings in New Zealand.

Risk mitigation measures available for use at pedestrian level crossings include:

- Pedestrian mazes
- Pedestrian lights
- Audible warning (bells, voice enunciated messages)
- Automatic pedestrian gates
- Manual pedestrian gates
- Automatic pedestrian barriers (not preferred)
- Illuminated footpath mounted lights
- Automatic pedestrian gates at pedestrian crossings

## 18. Cycle Level Crossings

From a risk assessment and mitigation perspective cycleways are treated in a similar manner to pedestrian level crossings.

Limited information on the treatment of cycleways at level crossings is available in the New Zealand Cycle Trail Design Guide February 2015 (4<sup>th</sup> edition). It is anticipated that more detailed information will be included in future releases of NZTA TCD Part 9.

## 19. Road Maintenance Standards

The standards of construction and maintenance of the road surface at level crossings **must be** adequate for the permitted road axle loads at that crossing. Paved, sealed and metalled crossings **must be** to the appropriate standards as laid down by the NZTA.

Special types of surfaces such as timbered, asphalted, rubber panel or precast concrete slab construction must not be installed without the agreement of the PH — Track. Special attention must be given to the provision of proper drainage and sound track construction at level crossings.

Asset Engineers should arrange for the review of track geometry standards applied, especially cant on curves to ensure that road users are given the best possible conditions provided that rail conditions and operations are not adversely affected.

KiwiRail as the rail access provider is responsible for the formation and maintenance of the road surface 5 m either side from the centreline of the railway line and will also construct or reconstruct level crossings in accordance with its standards.

The RCA is responsible for the formation and maintenance of the road surface beyond 5 m and all associated pavement marking related to the level crossing regardless of the 5 m distance.

## 20. Alarm Upgrading and Low Cost Improvement Programs

All stakeholders associated with road and pedestrian crossings must be involved with the determination of the final recommended treatment and placement on the upgrading list.

Traditionally the risk assessment of existing and modified railway level crossings has been undertaken using solely the ALCAM risk model developed in Australia. The ALCAM model has been updated over time and now identifies many of the key risk factors at level crossings. Being a model of a complex reality, it does not include every safety issue. To broaden the assessment, a new risk scoring system has been developed called the Level Crossing Safety Score (LCSS). This new

system looks at three additional data sources associated with crash risk (historical crash and incident data, safety observations made by locomotive engineers and RCA engineers, and a more detailed site assessment of the impact of the surrounding transport network and land-use) and brings these together with the ALCAM score. The LCSS is part of a new risk assessment process that has been developed for level crossings, called the Level Crossing Safety Impact Assessment (LCSIA). The intention of this process is to better understand the crash risk at level crossings and the safety issues that need to be addressed to make the crossing safer for all road users including, pedestrian types (eg young, elderly, disabled and able-bodied), cyclists, motor-cyclists, and drivers of trucks and private motor-vehicles.

## 20.1 Level Crossing Safety Impact Assessment (LCSIA)

The Level Crossing Safety Impact Assessment (LCSIA) process has been developed to assess the level of crash risk of existing and new / upgraded level crossings designs. The risk of pedestrians and motor vehicle crashes are assessed using the Level Crossing Safety Score (LCSS). The maximum score is 60, which denotes a very unsafe crossing. If a level crossing scored the lowest possible scores on every assessment, the overall lowest possible score a site could obtain is 10/60; therefore the 'Low' category begins at 10. This score consists of the crossings:

- ALCAM Score (30 points)
- Crash and incident history (10 points)
- A site-specific safety score (factors not covered adequately in ALCAM) (10 points) and
- Locomotive engineers and RCA engineers' observed assessment of risk (10 points).

The assessment is undertaken for vehicle and pedestrian crossings separately.

Based on these scores the crossing is placed into risk bands as shown in Figure 20.1.

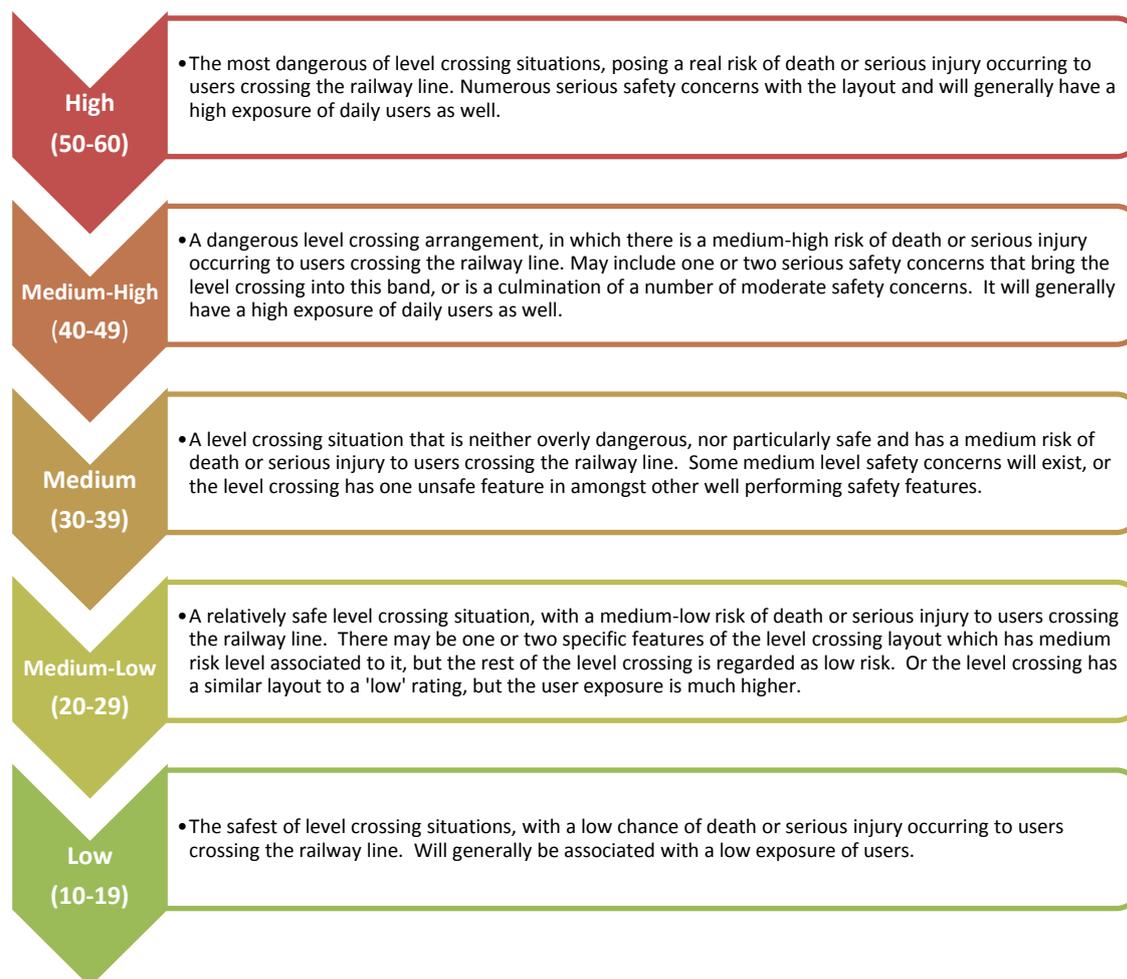


Figure 20.1 Level crossing safety score risk bands

## 20.2 Alarm upgrading program (AUP)

The Level Crossing Safety Score will be used to identify those pedestrian and road crossings that warrant upgrading to a higher level of active control. Those crossings in the High (50-60) and Medium High (40-49) categories will be considered for either:

- closure
- grade separation or
- upgrade works (flashing lights and bells, half arm barriers or automatic gates).

## 20.3 Low cost improvement program (LCIP)

Those identified as 'Medium Low' or 'Medium' shall be considered for:

- low cost remedial works and / or
- on-going maintenance
- LCIP strategy.

The purpose of the LCIP is to carry out low-cost improvements to reduce the risk of accidents at targeted level crossings as identified using the LCSS.

The types of activities carried out to address specific road and pedestrian crossing risks will be identified in the LCSS survey assessment and risk report, and may include:

- replacement or additional signage
- road marking
- pedestrian limit lines, tactile pavers, and mazes
- resurfacing on level crossings
- targeted vegetation clearance or batter trimming
- project management and modelling using ALCAM
- hard shoulders or slip lanes at intersections with stacking issues
- restricting vehicle movements or installing median islands
- active:
  - expect Train signage on road approaches to passive level crossings and
  - LED warning devices on approaches to passive pedestrian crossings.

Note these devices warn users to look for trains not that a train is approaching.

## 20.4 Risk Assessments of AUP and LCIS

All proposed AUP and LCIS treatments shall be agreed between the local RCA, landowners and KiwiRail. This will ensure that:

- LCSS is used to identify value-for-money and targeted safety treatments
- improvements are tracked in ALCAM
- improvements are tracked and can be integrated into Sirius / Maximo
- budgets are transparent and controlled
- deliverables are tracked and reported to the Public Good budget and
- the work meets KiwiRail and NZTA standards.

Approvals and consultation shall be with the following stakeholders:

- ALCAM Level Crossing team
- KiwiRail:
  - Area Managers
  - Signals (for work at active crossings)
  - Track (for work at passive crossings or resealing)
- Local RCA and
- Landowners.

Risk assessments for a project will be programmed for the financial year before construction (Year 1). This planning requirement better ensures that all project safety risks have been accounted for and that the design and construction of the project can be completed in the following financial year (Year 2).

## 21. Down Grading Policy

Where the rail, road or pedestrian count has fallen significantly and is unlikely to rise again and removal of protection results in substantial savings, automatic warning devices may be downgraded or replaced by passive protection after consultation with the local RCA. An ALCAM assessment must be undertaken to ensure that the downgraded protection does not push the level crossing into a higher risk band.

## 22. Closure of Crossings

### 22.1 Public level crossings

While New Zealand does not have a formal policy to close level crossings, it is clearly desirable to reduce, whenever practicable, the number of level crossings.

To close a level crossing built across a pre-existing public road, KiwiRail **must** have an agreement in writing from the RCA. This would normally have followed extensive consultation. Public notification of the closing must be arranged and the crossing fenced off immediately on both sides of the line.

### 22.2 Private statutory crossings

When the ownership of land has changed so that there are different owners on opposite sides of the line, or where alternative access has become available at a public crossing, the purpose for which the crossing was originally provided is no longer valid and the crossing is to be closed in accordance with Section 169 of the Public Works Act 1981.

## 22.3 Public and private granted crossings

With granted level crossings, a clause is typically inserted in the Deed of Grant giving the rail access provider the right to close such level crossings. Where there are valid reasons for closure, the procedure described in the Deed of Grant is followed. Corporate property shall be informed where the Deed of Grants exists and there is no possible alternative access due to subdivisions.

## 22.4 Non-statutory or non-granted level crossings

Private level crossings that are neither statutory nor granted are not legal until formally documented by the appropriate rail access provider, and may therefore be closed by the rail access provider unless such a grant is sought and obtained. All matters shall be referred to Corporate Property.

## 23. Cost Allocation

A high level summary of cost allocation for level crossings is shown in Table 23.1.

**Table 23.1 Level crossing cost allocation**

Crossing Type	Setup (Grant, ALCAM Assessment etc)	Procurement and Installation	Inspection and Maintenance	Repair and Upgrade
Public Granted	Applicant	As defined in Deed of Grant		
Public Statutory	KiwiRail	KiwiRail / RCA <sup>4</sup>		
Private Granted	Applicant	As defined in Deed of Grant		
Private Statutory	KiwiRail	KiwiRail / RCA		

### 23.1 Permits

For all work within the rail corridor, the RCA is required to contact KiwiRail and obtain an access permit. Likewise KiwiRail is required to obtain permits and traffic management plans for any work outside of the rail corridor.

Both RCA's and KiwiRail are strongly encouraged to waive application fees where the work being undertaken is in the mutual interest of both parties unless corporate property can identify that those fees are within the utilities code.

<sup>4</sup> The basis of cost sharing for work at level crossings on all roads held under Statutory agreement is:

- KiwiRail normally pays full costs.
- For alterations requiring raising or lowering the roadway – KiwiRail will cover the cost of reforming the roadway to new level, sealing and the cost of providing any protection (rail and road).
- For alterations requiring raising or lowering rail track – KiwiRail will reinstate track at its cost. The local RCA / Owner will provide balance of cost including cost of sealing and cost of providing any protection (rail and road).

## 24. Over Sized Loads

The NZTA TCD Part 9 outlines procedures for the safe handling of oversized (or over dimensional) loads to minimise any potentially conflict with rail movements, railway overhead services and equipment.

These types of loads will generally require the issue of a permit that authorises the movement and stipulates any specific requirements needed for the movement to take place.

For the movement of some loads, supervision or temporary relocation of equipment and/or lifting wires by the access provider may be required. Where this is the case, costs are recoverable from the vehicle operator.

### 24.1 Overweight loads

The movement of heavy loads over a railway line has the potential to permanently damage the railway line and its structure. The movement of these overweight loads over road, bridges and level crossings is administered by the RCA. Procedures involved are laid down in the NZTA Overweight permit manual.

### 24.2 Over dimension loads

The use of roads by over-sized loads is governed by the Land Transport Rule: Vehicle Dimensions and Mass 2002. Some loads require written permits prior to travel. Where such loads must cross-level crossings, the operator will be required to contact KiwiRail to gain approval to use these level crossings.

Particular care is to be exercised in the evaluation of slow moving and/or long loads over level crossings protected by automatic warning devices.

KiwiRail will determine whether a permit is required for the specific level crossings involved. If the movement across the level crossings is approved, any permit issued will define the special conditions for each level crossing required due to the size or type of the load.

## 25. Accidents

When an accident occurs at a level crossing:

- active warning devices **must be** checked for correct operation once it is safe to do so.
- a rail incident investigation **must be** undertaken and recorded in IRIS.
- no improvements to the crossing and associated infrastructure should be made until agreed by the General Manager Network Services.

Refer to the National Rail System Standard (NRSS) 5 – Occurrence Management for further information.

## Briefing Note(s) for G-ST-LC-9120 Level Crossing Management

Date Effective 01/06/2017 Issue No. Issue 1.0

### Background

This document outlines the requirements for the management of level crossings within KiwiRail. It replaces document CSG417.

### Key changes / compliance

This is the first issue of this document.

### Implementation

Applicability (Select relevant boxes)	All	Civil	Signals and Telecommunications	Structures	Track	Traction and Electrical
Communications	<input type="checkbox"/>					
Property	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network Services	<input checked="" type="checkbox"/>					
Zero Harm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PMO	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AMI	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>